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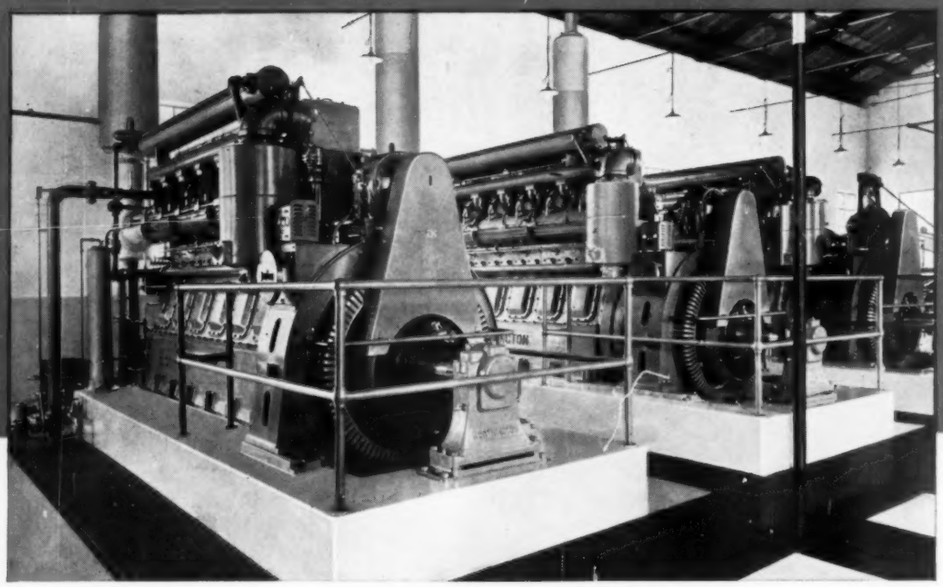

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DIESEL and GAS ENGINE PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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COVER ILLUSTRATION: Aerial view of the new Dutch Passenger liner, "WILLEM RUYS" which is fully described on pages 57-61 of this issue. Photo by Diepen-Ypenburg, Holland.

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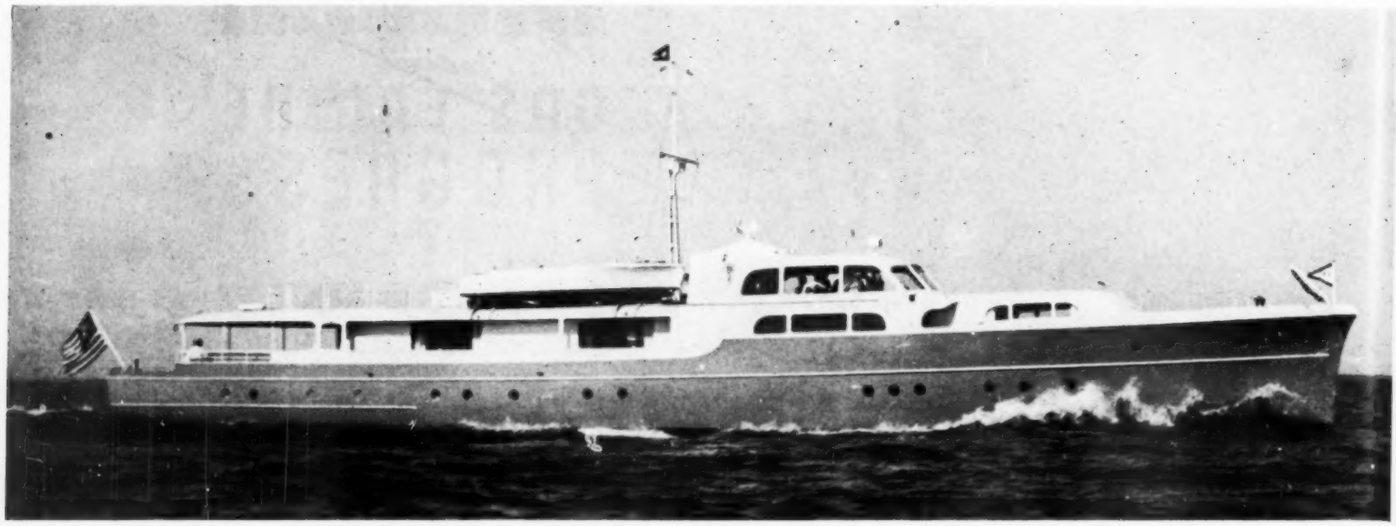
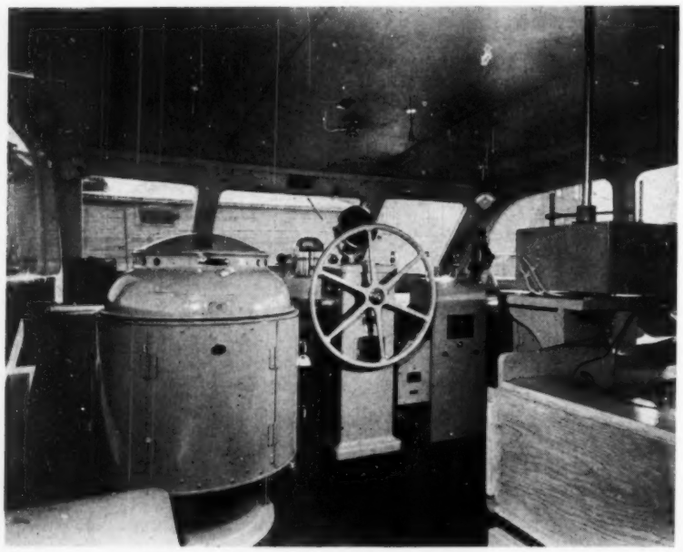


(Above) *Chanticleer*, one of five 118-foot Diesel yachts built by Defoe Shipbuilding Company. Note streamlined appearance.

(Below) Pilot house of the *Nunalvares* with Sperry Gyro, and Sperry automatic steering stand. RCA radio direction finder at right.

118-FOOT DIESEL YACHTS BY DEFOE



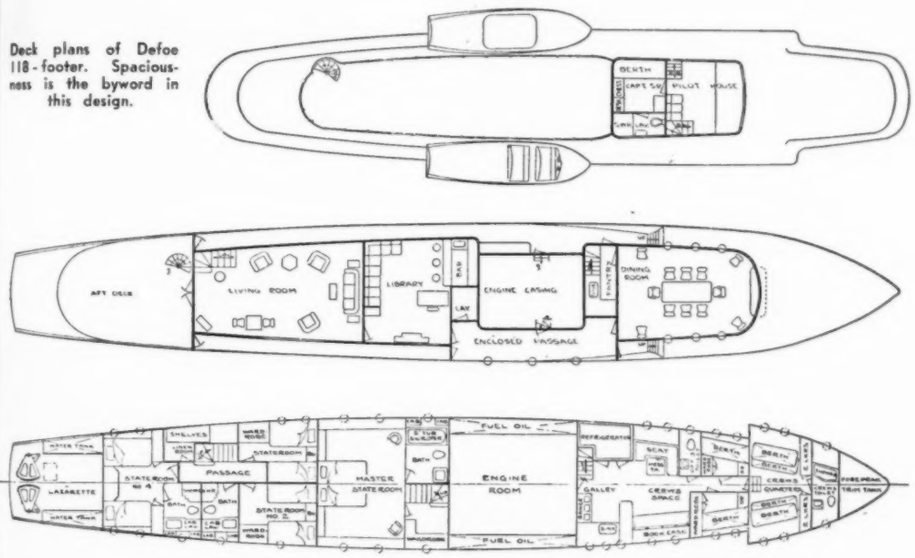
(Below) Library aboard *Chanticleer* measures 12 by 13½ feet and is furnished in modern manner.

Designer William Haines of Hollywood planned the *Savitar's* after deck with its functional curved furniture.

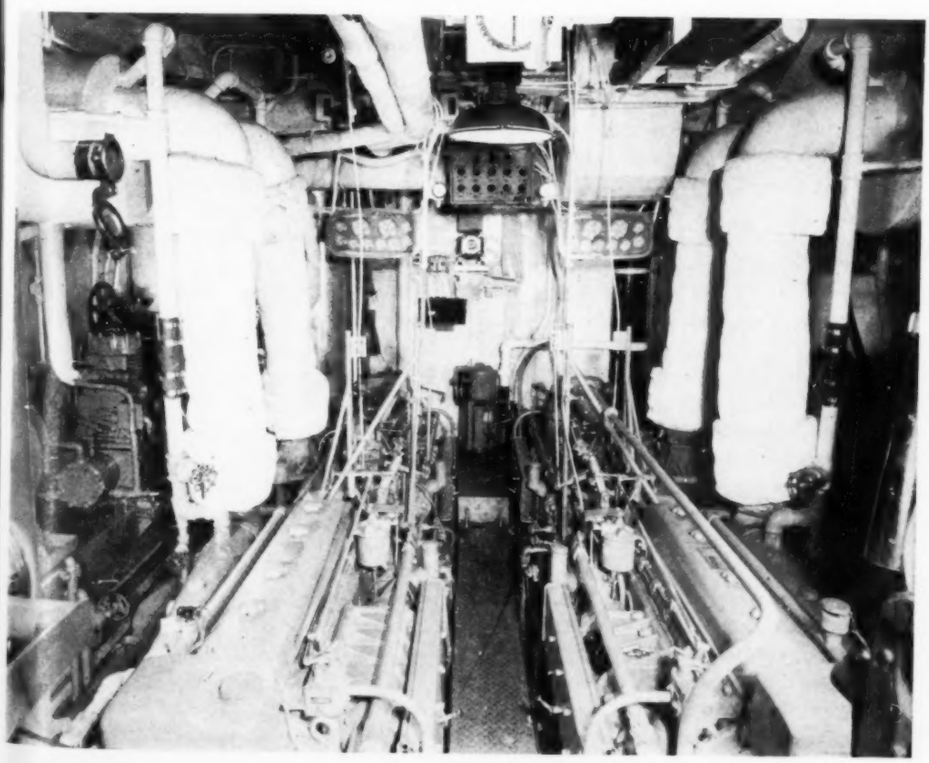
DURING the war the Defoe Shipbuilding Company built and delivered to the United States Navy 154 steel ships, mostly Diesel-propelled. In order to handle this volume of construction in the four years between 1941 and 1945, Defoe developed a quantity-production method, the basic feature of which consisted of building the hull of the ship upside down on a specially designed cradle, and then rolling the hull over for installation of the machinery and completion of the upper work. This became known as the "Roll-over" method of shipbuilding.

After the war the company projected a semi-standard steel yacht, 118 ft. y 18½ ft. on which it could employ to advantage many of the things it learned in its wartime experience bringing the yacht within range of the private pocket book, and five of these yachts have been built and delivered during the past year: *Chanticleer,* home port Pensacola, Fla.; *Walmar,* home port Portland, Maine; *Savitar,* home port Los Angeles, Calif.; *Natoya,* home port Detroit, Michigan; *Nunalvares,* home port Rio de Janeiro, Brazil.

The hull of every one of these yachts is standard. By building the same design of hull there is a great saving in cost which anyone familiar with construction work of any kind will readily appreciate. The machinery installation is standard—the same for every ship—which simplifies and saves cost both on purchasing and installation. In the upper work the construction methods are standard, but the arrangements of cabins both above and below deck are varied to suit each customer.



Deck plans of Defoe 118-footer. Spaciousness is the byword in this design.



Engine room the *Nunalvares* with 4 General Motors Diesels arranged in tandem pairs driving twin screws. Curtiss compressor seen at left.

The hull is of steel, all welded, and has five watertight bulkheads. All steel used has scantling sizes and is of a quality to meet requirements of the American Bureau of Shipping. Fresh water and fuel tanks are built into the ship's structure. Water tanks are located two forward and three aft, and fuel tanks one against the shell on each side of engine room, and two double bottom tanks aft of engine room bulkhead. Water capacity 4800 gallons; fuel capacity 4000 gallons. One sixty-four gallon lube oil tank. Entire inside of hull is insulated against both heat and sound transmission.

Steering gear is of manual type although three of the completed boats have Sperry Gyros and automatic pilots. With twin streamlined rudders, back of propellers, main engine controls are brought to a position beside steering wheel for one-man operation from the pilothouse. Weston electric tachometers indicating propeller revolutions are located in pilothouse.

Refrigerator is electric with one 80 cubic ft. chilling compartment at 40°F. Refrigeration machinery is located in engine room.

Main power plant consists of 4 General Motors Series 71 two cycle Diesels mounted as tandem pairs, each pair of engines drive a propeller shaft through reduction gears. Rating of each engine pair is 400 hp. maximum. Main engine exhaust is carried under water.

There are two Diesel engine driven generators, manufactured by the United States Motors Corporation, one of 15 kw. and one of 10 kw., furnishing current at 110 volts, D.C. for all ship's auxiliaries. Exide storage battery is furnished of ample size, floating on the line for night lighting.

The Kerr, Tuthill and Jabsco pumps are electric driven. They consist of one sanitary pump connected to a pressure tank, one fresh water pump connected to a pressure tank, one bilge and fire pump, one Diesel oil transfer pump, one fresh water transfer pump, and one sump pump for soil system. A small automatic electric air compressor is installed for whistle and general engine room use. Main engines and generators are electric starting.

Particular attention is given to sound insulation throughout the ship. All machinery is installed on Korfund acoustical mountings for this purpose, even the propeller shafts being sound insulated from the structure as are all pieces of moving machinery. As a result hardly any mechanical sound reaches decks or quarters.

DIESELS HARVEST CALIFORNIA SUGAR BEETS

By F. HAL HIGGINS

State Regains No. 1 Position with Big Diesel Tractors and Modern Harvesters

CALIFORNIA is back in No. 1 beet sugar production position and the Diesel crawler tractor played its part in putting it there in spite of war and competition from rival crops. It's a great story of farmer achievement to meet a national emergency when the nation faced a sugar famine while political do-gooders and fellow travellers honeycombed the governmental machinery and playfully tossed monkey wrenches into industrial and farming operations to test their theories of government by and for the "underprivileged."

The fifth general meeting of the American Society of Sugar Beet Technologists in San Francisco at the same time as the annual meeting of the California Beet Growers' Association, Ltd., early in 1948, gave your Old Reporter a chance to re-check the progress of this industry as it emerges from the war and early post-war boom. Wheat, potatoes, corn, hay, and even cotton, seemed to be passing the sugar beet on its way to a firm place in the American farmer's time, land and labor. But about 17 years ago, the writer recalls being invited in on a huddle with Great Western Sugar Co. officials at their offices in Minneapolis. He drove up to their Fargo factory in the heart of the famed Red River Valley of the North. The question was to get the farm tractor manufacturers interested in developing sugar beet harvesting machinery to open up wide demands for crawler tractors. The depression halted any further talk at that time and in those quarters. But the idea was there in the minds of the beet sugar factory men. They had gone as far as they could in perfecting their end of the industry, but the grower end had remained static as a drudge job for imported Mexicans, Filipinos, Japanese, and such groups as could be induced to come in and do such work on a contract basis.

About 12 or 13 years ago, the beet industry had reached the stage of talk and cooperation when the processing companies pooled a fund and handed it to the Agricultural Engineering departments of California and Colorado Agricultural colleges with the U. S. Department of Agriculture cooperating. California was ready for mechanization of this crop. In that state, a crop is either handled by machine or it can't stand up in competition for the good land and managerial skill and labor. Prof. H. B. Walker had just come out from Kansas to head the Agricultural Engineering division of the University of California. He brought with him a staff of other mid-west agricultural engineers. One of these was Roy Bainer, now head of the department since Walker's retirement a few months ago. Walker and Bainer took the California problems in stride; first, rice combining and drying; then bean threshing without cracking, etc. They worked along without noise or much acclaim for the first few years. Then the beet sugar industry handed them a real one: mechanization of the sugar beet crop with its long list of sporadic efforts and failures including many by the factory engineers who were handing this one to the professors.

For several years, the men on the beet harvesting problem didn't have much to show for the time and money they were spending. Bainer was on the job with Walker looking over his shoulder all the time. They looked at everything done in any and all beet growing areas – Colorado, Utah, Idaho, Oregon, California. Little shops here and there had done something on toppers, lifters or loaders. Some had combined one or more of these processes. Now and then one had done a little work that wasn't too bad under certain conditions.

Bainer was also working with McBirney, who was stationed at Colorado Agricultural College most of the time. Also, with the late Mervine at the same college. Bainer heard rumors of what the Germans were doing, too. Also, he kept sizing up that tough little beet seed with its wrinkled coat that covered from 2 to 5 seed units. Finally, he figured that seed might be broken down to single seeds to give uniform plantings so that the crop could be easier thinned. The chips were down and the men with the money were looking down the professors' necks when he came up with a shearing wheel that broke down the seed for planting of singles. It worked, and immediately the "sheared" seed was prepared and handed to growers all over the beet areas by their local factories.

It was the writer's privilege to be out at Ryer Island in October, 1942, a little over five years ago, when the Marbeet complete beet harvester was given its first public trial on Al Jongeneel's beet field. Al is a big "California Dutchman" who farms with head as well as with his six feet-plus of brawn. War was breakng in 1942, labor was becoming scarcer and he had a crop to get out.

"Make me a harvester," he told his local blacksmith. They look over the junk pile back of the little smithy and put together some odds-and ends from trucks, tractors, plows, etc., to come up with something that got the beets out the first time. They were a little ragged in the tops left on, but they lifted the beets, topped them and loaded them into a truck traveling alongside the harvester.

At the first trial, Profs. Walker and Bainer were present. So was International Dealer George Gordon, a Stockton oil distributor, and a local welding shop owner as well as the farmer and the blacksmith who put the thing together.

An International Diesel TD9 pulled that first Marbeet. Big crawler Diesels—Caterpillar D6s,

International Diesel wheel tractor pulling a beet loader. More and more wheel tractors are being equipped with Diesel engines to meet the efficiency of Diesel crawlers.

Cletrac crawler with Hercules Diesel at work in Salinas valley preparing beet seedbed.

Allis-Chalmers HD 10s, Oliver-Cletracs and International Td 9s and 14s have delivered the goods in pulling these harvesters through until they harvested 70% of this 1947 crop.

"The Marbeet harvester was developed," says International dealer-backer George Gordon, "and built by a group of Rio Vista Delta men, with the cooperation and assistance of California sugar-beet growers and processors. This harvester was manufactured in sufficient quantities to supply the demand in California and to prove that beets could be mechanically harvested.

"The Blackwelder Manufacturing Company was formed and a small plant constructed and equipped at a time when such expansion was considered impossible. During the past five years, 617 Marbeet harvesters were built to harvest sugar beets grown in California.

"There were 119,121 acres of beets harvested in California during the 1946 campaign, of which 66,155 acres, or 55.55 per cent, were harvested by Marbeet—a record far beyond that accomplished in any other state. The figures are not complete at this time for the 1947 campaign, but it is conservatively estimated that between 70 and 75 per cent of our California acreage is the record for this period. California growers and processors agree that this season was the best ever, from a tonnage viewpoint, the low cost, and the freedom from hand labor 'headaches.'"

"The two row model has made several outstanding tonnage records, many greater than expectations. A grower in the Salinas area delivered 400 tons during nine hours' harvest; ten carloads of sugar beets in one day. With the proper tractor and care, this model will harvest an average of ten acres per day at an amazingly low tonnage cost. With the savings made in comparison with hand labor, many growers claim they have paid for their machines within thirty harvesting days. Add to this the grief avoided by eliminating numerous labor troubles, and it is easy to see why in California the Marbeet two-row is regarded as the machine that kept sugar beet growers in a profitable business."

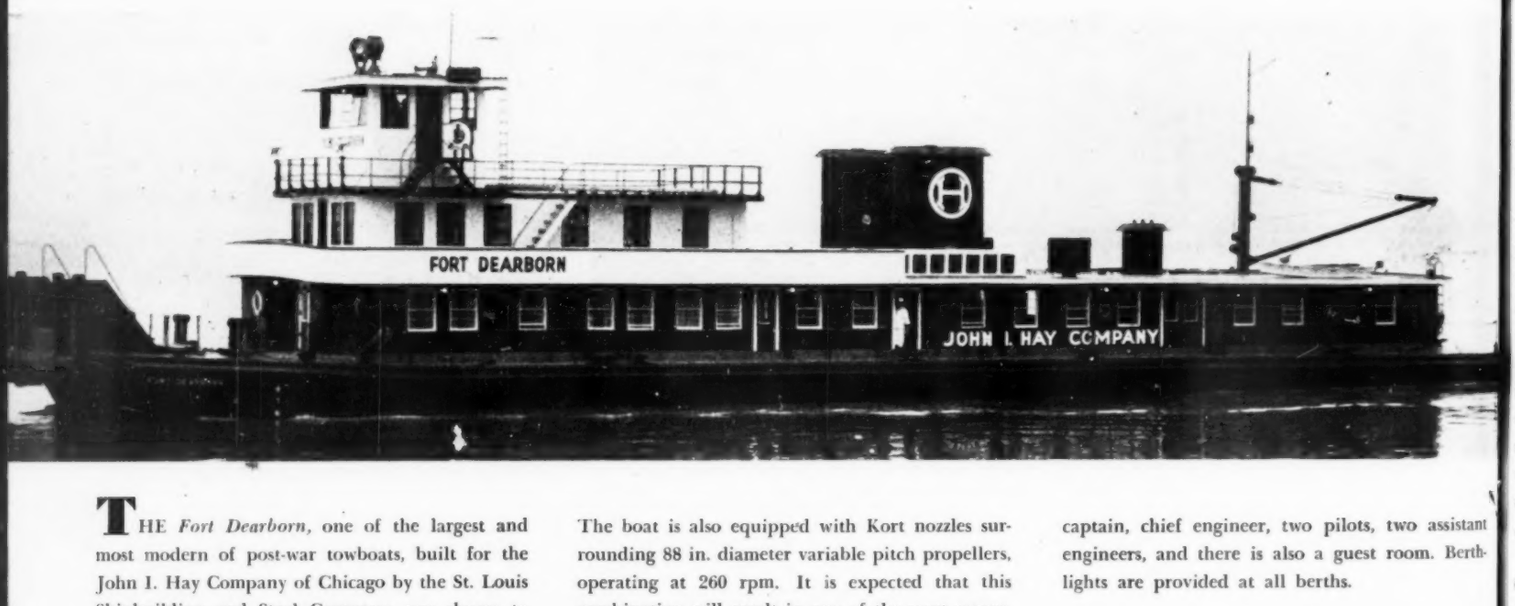
Caterpillars, Internationals, Allis-Chalmers and Cletrac Diesel crawlers have made this remarkable mechanization of beet farming possible.

Caterpillar Diesel carrying "Soilserv" tanks for sterilizing soil to clear it of nematode and wire worm infestation.

Two-row Marbeet harvester at work in Santa Clara valley. International Diesel unit supplies power.

OPPOSED-PISTON DIESELS FOR NEW TOWBOAT

By WILL H. FULLERTON



THE *Fort Dearborn,* one of the largest and most modern of post-war towboats, built for the John I. Hay Company of Chicago by the St. Louis Shipbuilding and Steel Company, was shown to friends of the companies and to the press at the St. Louis Mississippi river water front recently. The *Fort Dearborn,* designed by the shipyard, has a number of unusual features in its construction. It joins the Hay Company fleet of pusher boats which propel long river trains of barges on the Mississippi-Illinois rivers and the Gulf Intracoaster Canal. It was named the Fort Dearborn, because the headquarters and principal place of business of the Hay Company is in Chicago. The new boat will operate on the same route as the highly successful *George T. Horton,* put into service two years ago on the Mississippi route of the company. It will serve St. Louis, New Orleans and intermediate river points. The Fort Dearborn will serve as a bulk commodity and common carrier of freight in the Hay Company's barge line.

The Fort Dearborn is a twin screw towboat, with an all-welded steel hull. It is 156 feet long, and has a beam of 35 feet and a depth of ten feet. Its power unit consists of two 10 cylinder opposed piston-type Fairbanks-Morse Diesel engines and is the first new towboat on which this type of engine has been used.

The boat is also equipped with Kort nozzles surrounding 88 in. diameter variable pitch propellers, operating at 260 rpm. It is expected that this combination will result in one of the most powerful towboats on the rivers. The boat was built to meet the highest classification of the American Bureau of Shipping. Its normal draft is 7 feet, with a 7 ft. 6 in. draft when fully loaded with 310 tons of fuel oil. This fuel oil capacity is sufficient for 21 days running under full load!

The hull is divided into 25 watertight or oil-tight compartments, and is one of the strongest on the inland rivers. A minimum of ⅜ in. plate was used on the hull, except the deck inside of the house, and all bulkheads are of ⅜ in. plate, stiffened both vertically and horizontally. The bilge strake and tunnel plating are ½ in. thick. For fore and aft strength, in addition to the side plating, there are four longitudinal bulkheads and one longitudinal truss running from bow to stern.

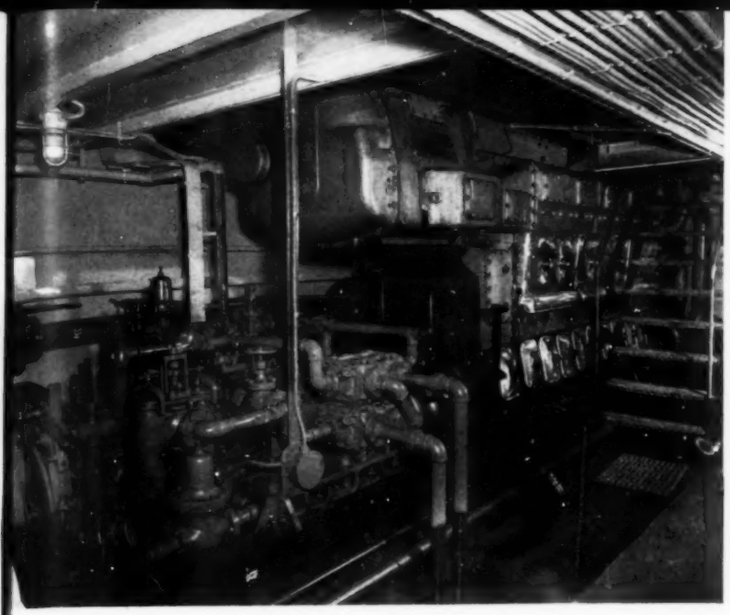
The deckhouse of the *Fort Dearborn* is of 3/16 in. plate and extends aft to within 10 feet of the stern of the boat and covers the steering gear. The galley, crew's mess, officers mess, crew's lounge, and quarters for 18 persons are located on the main deck. On the upper deck, accommodations are provided for an officer's lounge, quarters for the captain, chief engineer, two pilots, two assistant engineers, and there is also a guest room. Berthlights are provided at all berths.

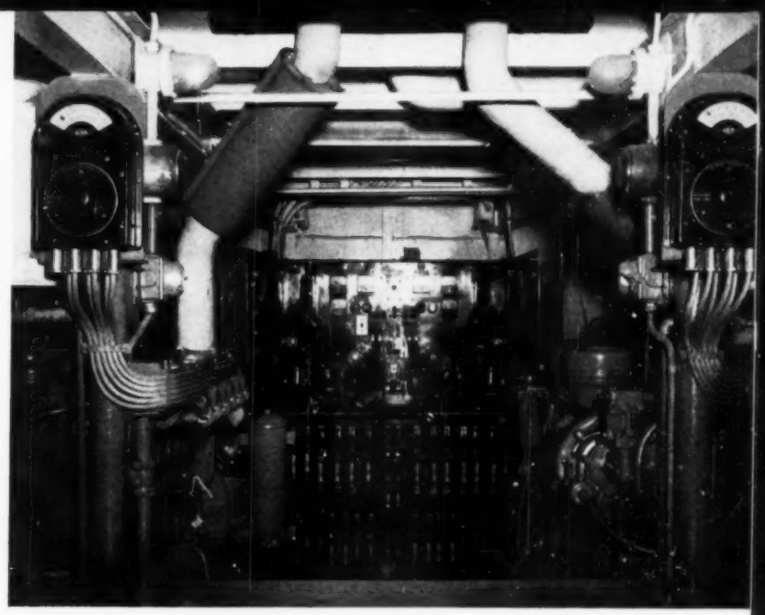
The steel deckhouse is lined with ¼ in. tempered masonite, and insulated with 2 in. of fibreglas. All particitions are of double paneled masonite. Truscon double hung steel sash is used throughout the boat with the exception of the forward pilot house windows which slope inward at the top and are made of tuflex glass bounded with brass frames manufactured by St. Louis Shipbuilding Co. All outside doors are of steel construction, all interior doors of wood. All floors in the galley, messrooms, quarters, and pilot house are covered with Armstrong grease-proof asphalt tile.

An unusual feature designed to make the towboat fireproof is that the curtains in all quarters, lounges, and messrooms are of glass cloth.

The galley is equipped with a South Bend oil burning range and a two compartment walk-in refrigerator with one compartment for cold storage and one for frozen foods. Across the aft wall in the galley is a row of metal cabinets with a stainless steel top and double sink.

The main engines are a pair of 10 cylinder, 8½





in. x 10 in. x 10 in. opposed piston Fairbanks-Morse Diesels which because of their reduced ratio of weight and displacement to horsepower are suited for river boat service. They develop normally 1600 horsepower each at 720 rpm.

The fundamental feature that differentiates the Fairbanks-Morse, two-stroke cycle, opposed-piston Diesel engine from other Diesels is the use of an open ended cylinder. Combustion takes place in the center of the cylinder between two pistons, each moving away from the other and in so doing uncovers the exhaust and air inlet ports. The engine has two crankshafts, one located above and one below the cylinders. The pistons controlling the air inlets are connected to the upper crankshaft and those controlling the exhaust ports are connected to the lower crankshaft.

Correct timing between the upper and lower pistons and cooperative effort from the two crankshafts is accomplished by connecting them together by means of a vertical shaft and bevel gears.

The scavenging air blower, fuel oil and lubricating oil pumps and water service pumps are all attached, making a self-contained engine unit.

The weight has been reduced and strength increased by using a cylinder block or frame which is fabricated from rolled steel plate and shaped and electrically welded into a homogeneous unit. The engines are equippd with Burgess spark-arresting exhaust silencers.

Coupled to the Farrell-Birmingham gear by a special half-coupling of St. Louis Shipbuilding design, is a 9 in. propeller shaft supported on a Medart heavy-rigid pillow block, an oil lubricated bronze stern tube bushing, and a Goodrich Cutless rubber bearing at the stern strut. The cast steel propellers are 88 in. diameter and have variable pitch, operating in Kort nozzles manufactured and installed by St. Louis Shipbuilding Co.

On account of the large horsepower developed by the engines, the St. Louis Shipbuilding & Steel company's standard type of skin cooling system was modified, and necessary cooling area was provided by means of a series of heavy fenders on each side of the boat, which provided the necessary cooling surface.

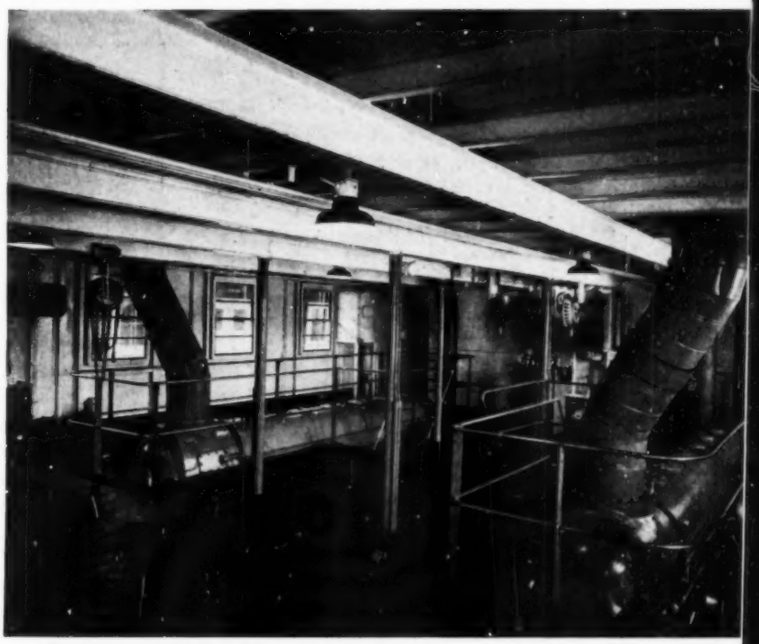
The steering of the *Fort Dearborn* is the electro-hydraulic type with electric follow-up. This is the same system used on the *Sohioan, Sturgis, Havana Zephyr,* and most of the other large towboats built by the St. Louis Yard.

The starting air for the main engines is provided by an Ingersoll-Rand compressor, driven by a 7½ hp. electric motor, and a Gardner-Denver type ABC compressor, driven by a 10 hp. electric motor. The drinking water on the *Fort Dearborn* is carried in a tank, and supply is taken from approved sources on shore. The wash and sanitary water is carried in a tank and the water is taken from the river and filtered through an Elgin Marine sand filter with an Elgin coagulant feeder with orifice; then the water is treated by means of a Proportioneer's heavy duty Chem-o-Feeder. The water is then filtered through a Lynn Stone filter before being used.

A Crane Co. hot water heating system with circulator and cast iron radiators keeps the quarters comfortable in cold weather, and fans and ventilators provide adequate ventilation for hot weather.

The electric power for the *Fort Dearborn* is supplied by two 60 kw. General Motors Diesel generating sets and a 20 kw. General Motors Diesel generating set for use when in port. These Diesel engines are equipped with Clark-Cooper oil and water alarms.

On the forward deck are two Schoellhorn-Albrecht Capstans driven by 10 hp. electric motors. The fire pump is a MicroWestco pump driven by a 10 hp. motor and has a capacity of 100 gpm.



One of two 10-cylinder opposed-piston Diesels aboard the *Fort Dearborn*. Farrel-Birmingham reduction gear in left foreground.

(Above right) Switchboard flanked by two General Motors Diesels. Brown pyrometers seen extreme left and right.

Tops of main engines seen in upper engine room view. Control stand seen forward. Burgess exhaust snubbers are fitted for main engines.

DIESEL ENGINE SMOKE SYMPOSIUM

Smoke In High Speed Diesel Engines

By J. J. BROEZE and C. STILLEBROER

Hot Smoke

Destructive combustion is the predominant type of combustion in Diesel engines, and especially so under high-temperature conditions. Cracking of fuel vapours is followed by direct oxidation of relatively small fuel fragments, amongst which is pure carbon. The oxidation reactions proceed as the decomposing vapours are mixed with air, and with lack of air the fuel fragment most reluctant to burn appears in the exhaust as free carbon, in the form of suspended soot.

With complete mixing no soot would result until, with increasing fuel supply, all available air has been consumed, fig. 1, curve I. In real engines,

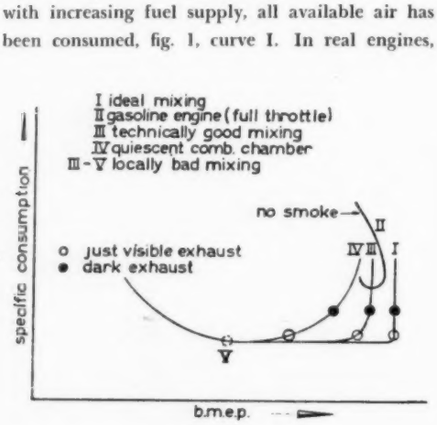


Fig. 1.

with the most thorough mixing, 5-10% excess air remains at maximum load, but the onset of smoke is quite close to this maximum load, curve III. In more quiescent combustion chambers locally overrich mixtures are not split-up soon enough and burn way down in the expansion stroke. Smoke is already visible at lower loads and the smoke density increases gradually, curve IV, with the load. Such an engine will naturally operate for much of its running time in the smoke region.

Fuel properties may affect exhaust smoke as far as fuel properties may affect an incomplete mixing process, that is near the maximum load and especially so with a quiescent combustion chamber.

Highest smoke density and highest consumption are obtained with fuels of high ignition-quality. With the short delay-period of these high-cetane fuels, the fuel sprays are not fully developed when ignition starts. The heat generated after ignition results in intensive evaporation which hampers further distribution. This case was the first instance of the paradox that a paraffinic fuel causes more sooting than an aromatic one, a paradox which it is well to keep in mind as it upsets attempts to attribute all ills to fuel properties. The adverse effect of high ignition-quality is enhanced by high volatility. With fuels of lower volatility another factor appears: their penetration is higher and an appreciable quantity of fuel reaches the fairly hot piston crown and evaporates from there into the boundary air. With fuels of too low volatility, however, evaporation takes too much time

Editor's Note: In view of the increasing interest on the part of Diesel operators and engineers, of the problem of Diesel smoke, we take this opportunity to present abstracts of three papers presented before the Annual Meeting of the S.A.E. in New York City during January which were presented as part of the Smoke Symposium under the Chairmanship of Dr. P. H. Schweitzer of Penn State College. The papers abstracted here are as follows: "Smoke in High Speed Diesel Engines," by J. J. Broeze and C. Stillebroer of the "Delft" Laboratory, Holland, Royal Dutch Shell; "Diesel Engine Exhaust Smoke As Influenced by Fuel Characteristics" by H. D. Young, Project Engineer, Sinclair Refining Company; and "Influence of Injection Characteristic on Exhaust Smoke" by Martin Berlyn, Vice President in Charge of Engineering, American Bosch Corporation. Abtracts of the remaining papers presented at this meeting will be published next month.

and the resulting vapours burn late in the expansion stroke. Hence, for each cetane number there is an optimum value for volatility.

In precombustion engines the fuel spray has no function in the mixing process, which in itself is rather thorough. These engines, therefore, react differently to fuel properties. Some of the factors involved may be demonstrated for a swirl-chamber engine, fig. 2. In view of the small influence of

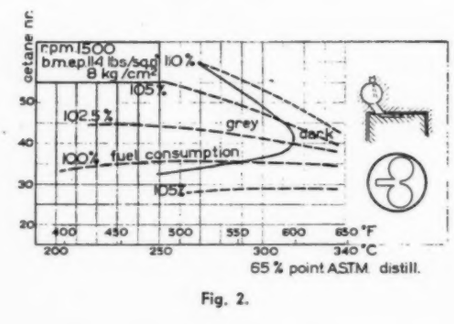


Fig. 2.

fuel properties, the load has been chosen for rather high smoke densities and the consumption figures have been corrected for heat-value.

Lowest smoke density and best consumption are obtained with fuels of 35-40 cetane number, independent of volatility. The walls of the heat-insulated swirl-chamber are apparently hot enough for all deposited fuel to evaporate and to burn within a short time. With higher-cetane fuels of low volatility, smoke density and consumption increase. The cause is that when ignition starts after the shorter delay-period, the fuel is more confined in the upper part of the swirl-chamber, and less vapour has been generated. The ensuing pressure rise in the swirl-chamber is less and the resulting blast from the chamber, which performs the mixing in the cylinder, is weaker.

Cold Smoke

Apart from destructive combustion, direct oxidation of larger fuel fragments occurs as well, leading to the formation of peroxides, aldehydes and organic acids as intermediate combustion products. This "aldehydeous combustion" becomes of more importance if the temperature of the surroundings of the burning vapours is kept relatively low. On quenching the reactions by further chilling, the intermediate combustion products appear in the exhaust, causing the well-known pungent acrid odor. When condensable, they cause the bluish smoke, which may also contain slightly oxidized, condensed, fuel vapours. The main problem is to avoid, at low load, intensive mixing of fuel with cold air and deposition of fuel on cold walls. The best, if not the only, way to reduce cold smoke is to keep the combustion space hot. The latter cannot be done in a direct-injection engine, and smoke is usually visible at fast idling, fig. 3.

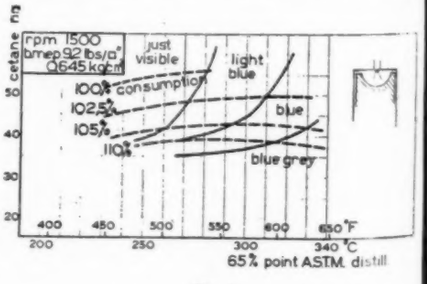


Fig. 3.

High volatility is favourable because fuels of high volatility have the least tendency to condense near the cool combustion chamber walls.

Under idling conditions the influence of fuel properties in swirl-chamber engines is similar to that in the direct-injection engine, fig. 4. However, owing to the hot swirl-chamber evaporation is quick and smoke is noticeably less dense.

Conditions are more favourable for the formation of smoke at acceleration after a period of idling. For then the same quantity of fuel as under full load may enter a cold combustion space. In a direct-injection engine over-penetration cannot be avoided and the deposited fuel cannot come off the walls in time. The mixing process, though it may be satisfactory under conditions of equilibrium, is upset.

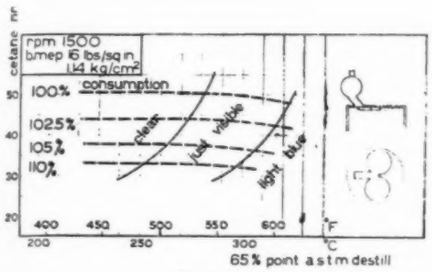


Fig. 4.

Engines with a heat-insulated precombustion chamber are not much troubled by the acceleration-smoke problem. The high fuel-air ratio in the precombustion chamber causes its temperature to vary relatively little with load, fig. 5. During acceleration the mixing conditions are not much different from those at full load at the same momentary speed, and combustion remains unaffected.

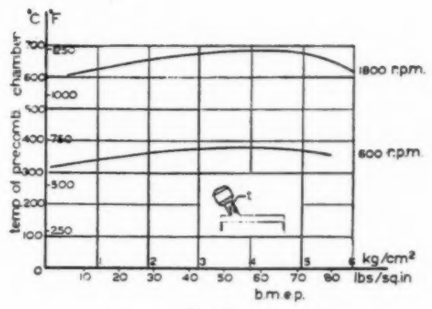


Fig. 5.

The tests described show that observations on smoke and on consumption can give an insight into factors and mechanisms involved in the combustion process. The precombustion type of engine appears to show characteristics which are quite different from those of engines with direct injection. Basically, the difference is brought about by the different way in which the problem of fuel distribution is solved. With direct-injection, the fuel is distributed by the fuel sprays, and evaporation and air movement have to correct the incompleteness of this distribution. In a precombustion engine the injection system has no function in the distribution process, which is performed by evaporation in the precombustion chamber and by blast created by the initial explosion in that chamber.

Diesel Engine Exhaust Smoke As Influenced By Fuel Characteristics

By H. D. YOUNG

THE experimental data given in this paper represents a study made of the influence of the fuel properties, ignition quality and volatility, upon Diesel engine exhaust smoke, exhaust odor and lachrymation. These data were developed for use in evaluating fuels used in Diesel buses operating in city service and powered by GM 71 Series engines.

The test work was carried out in the shops of the Baltimore Transit Company at Baltimore, Maryland. A single bus, operated on a Clayton chassis dynamometer under simulated road conditions such as encountered in city service, was used. Fig. 1 shows a schematic diagram of the test setup. Exhaust smoke readings were taken at the bus tail pipe by means of a CRC smokemeter. Odor and lachrymation determinations were made by means of a "stink-box." This latter was nothing more than a sizeable can with inlet and outlet connections for the exhaust and a small aperture in one side for the convenience of the observers in "smelling" the smoke and determining its irritating properties."

Twenty-six fuels were tested which ranged in volatility from 500°F. to 650°F. end point, and from 43 to 60 cetane number. Additions of amyl nitrate up to 0.5% by volume were used to vary cetane number in certain instances.

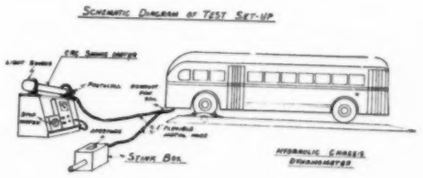


Fig. 1.

The test bus was started, placed in direct drive and operated under load at 650 rpm. until the desired jacket temperature was reached. After reaching this temperature the bus was run 5 minutes longer to stabilize the operation. At the end of this period the engine was idled for 9 minutes at a speed of approximately 320 rpm. and then accelerated until 2000 rpm. was reached. Following this the bus was placed in direct drive and operated at 1200 rpm. under moderate load for 3 minutes. Smoke, odor and lachrymation readings were taken after 5, 7 and 9 minutes of idle as well as in direct drive after 2 minutes of operation. Smoke readings only were taken during acceleration. The cycle used was developed from observations made of 150 buses operating in city service.

Field tests have indicated that the use of light Diesel fuels in the kerosene range materially improve smoke conditions. However, lachrymation and sometimes odor are often more serious than when using heavier fuels. Also, heavier fuels may show improvement in economy over these light fuels amounting to as much as 7%. Fuel consumption data for Fuels #1 and X are shown in Fig. 2. These two fuels were check tested in the fleet several times. On the basis of their calculated Btu. value per gallon the difference between the heat content of Fuels #1 and X is only 1.6%. In-asmuch as co-operative full-scale tests on Diesel engines have indicated that variations in economy are a direct function of the Btu. value of the fuel, it is probable that the greater difference shown for field performance of the two fuels may be due to the unusual operation of city bus service.

In Fig. 3 there is shown the influence of variable jacket temperature on exhaust smoke, odor and lachrymation. Fuel #1 is a 53 cetane number fuel of 406°F. initial and 648°F. end point. Fuel #2 is a 49 cetane number fuel of 379°F. initial and

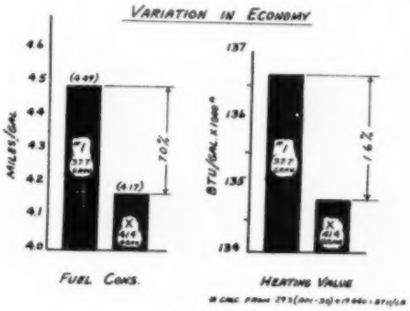


Fig. 2.

637°F. end point. The exhaust smoke for both fuels, particularly under idle operation, was appreciably less at 190°F. jacket temperature than at 160°F. There was also some improvement in the exhaust odor at the 190°F. jacket temperature during idle. In direct drive the two fuels had a "good" odor rating at both temperatures. The lachrymation characteristics of the two fuels at 160°F. and 190°F. during idle could be termed acrid and thus rather objectionable. In direct drive, lachrymation was bland for both fuels, irrespective of jacket temperature.

In evaluating the smoke performance of these fuels as well as those in the succeeding series in terms of their fuel characteristics, the 50% point was found to be a fair criterion of exhaust smoke, although in a considerable number of instances this yardstick failed to apply. The nearest approach to good correlation of fuel properties with exhaust smoke was found to be: *the sum of the per cent fuel evaporated at a series of fixed distillation temperatures taken at uniform increments which encompass the initial boiling point and approach*

or include the 50% point of the fuel. In any given series of fuels the higher the sum of the per cents distilled the better will be the fuel in regards exhaust smoke.

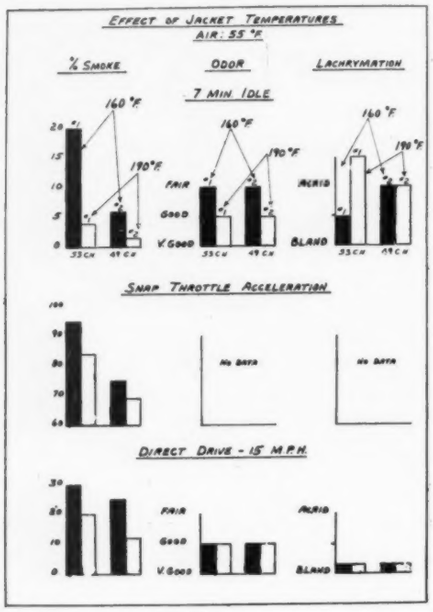


Fig. 3.

As will be seen, exhaust odor for the lighter fuels is generally better than for the heavier fuels under idle operation. There is very little difference in direct drive. In respect to lachrymation, the heavier fuels are possibly better than the light fuels during idle but there appears to be no difference in direct drive.

In concluding this paper, the following facts and trends appear to be indicated from the experimental data:

1. Fuels possessing 50% points of 475°F. and below are generally suitable for city bus use.
2. Considerable flexibility is permitted in the selection of the IBP and EP of a fuel, providing the distillation curve is pivoted around a 50% point of 475°F. or lower and providing further, that the selection of the IBP and EP, relative to each other, are in the right direction. Thus, if the IBP is high, the EP must be low. If the IBP is low, the EP can be moderately high. Generally speaking, for a fuel of 400°F. IBP and 475°F. midpoint, the EP should not exceed 600°F. For a fuel of lower IBP, say 360°F., the EP can run as high as 635°F. and yet function reasonably satisfactorily in city bus service.
3. While these data tend to indicate maximum volatility limits for city bus fuels, such fuels may not be generally available at the present time. Also, because of attendant distribution costs such fuels probably could not be marketed as cheaply as #2 or #3 Diesel fuel.
4. For fuels of given IBP, exhaust smoke varies directly with tail-end volatility; the lower the tail-end boiling range, the lower the exhaust smoke. For fuels of fixed end point, the fuel having the highest sum of per cents distilled and/or the lowest mid-boiling point, will give best exhaust smoke performance.
5. Light Diesel fuels such as kerosenes make satisfactory city bus fuels in respect to exhaust smoke and odor. Lachrymation, however, may be more serious than for fuels of higher boiling range. Appreciable reduction in fuel economy as based on performance with heavier fuels may also occur.
6. Within the cetane number range of the engine, fuel volatility appears to overshadow the influence of ignition quality in respect to exhaust smoke. Cetane number appears to have some bearing on exhaust odor, particularly during idle. The higher the cetane number, the better may be the odor during idle.
7. The addition of amyl nitrate tends to improve exhaust odor by increasing cetane number. Lachrymatory discomfort may be slightly increased, however.
8. Exhaust smoke and odor are influenced appreciably by engine jacket temperature. The maintenance of a high jacket temperature will contribute very measurably towards reduced exhaust smoke, possibly overshadowing the influence of fuel effect.

Influence of Injection Characteristic On Exhaust Smoke

By MARTIN BERLYN

In order to isolate from the desired fundamental injection characteristic those overtones which may be smoke-makers it must be recognized at the outset that defective details of design in the engine itself can cause smoke for which no cure should be sought in the fuel system.

It will therefore be assumed, for the purpose of this discussion, that the engine designer has already eliminated all the potential causes of smoke other than those which may properly be ruled the responsibility of the injection function.

If all potentially smoke-making attributes are avoided, and if the peculiarities of the engine design are properly evaluated in the selection and application of the injection equipment, smoke-free operation may be achieved.

The influence of injection characteristic on exhaust smoke cannot be considered without reference to other operating qualities of the engine. It must be presumed

(1) that the engine is required to develop a *competitive BMEP* without smoke.

(2) that it shall operate with *competitive S.F.C.* without smoke,

(3) that it shall be endowed with *competitively smooth combustion* without smoke,

(4) that it shall be a *competitively good cold starter,*

(5) that, not only shall it not smoke under steady rated load, but it shall not smoke during acceleration or when idling.

The means by which all this must be achieved may not cost an amount which will lift the engine selling price or service charges above competitive levels.

Now, therefore, when aiming at an injection characteristic to give freedom from exhaust smoke we are aiming at an all-around perfect injection characteristic, and it cannot be over-emphasized that the successful marriage of the fuel and the air in the cylinder is the joint responsibility of engine designer and injection engineer and that smoke-free operation until all reasonable conditions of service postulates the closest collaboration of these two throughout the development of the engine. Following is a tabulation of some attributes of injection which may give rise to smoke under some or all conditions of operation; the order of tabulation is purely arbitrary:—

1. Excessive penetration of spray.
2. Insufficient penetration.
3. Uneven or improper dispersion.
4. Unsuitable droplet size.
5. Improper timing of start of injection.
6. Improper rate of injection during discharge.
7. Excessive duration of injection.

1. The desirable degree of penetration varies over an enormous range according to the type of engine. In general, those engines which provide a high degree of turbulence in the air charge during compression prefer a soft spray of low penetration whereas those having comparatively quiescent air in the combustion chamber seem to require a spray of considerable penetration.
   Excessive penetration, resulting in impingement of the fuel on the cylinder head or piston crown, usually causes smoke at the higher loads and, except in severe cases, this symptom may not be apparent at partial loads.
   Some engines require an injection having two magnitudes of penetration in separate, but concentric, sprays emanating from the same orifice. The throttling-pintle type nozzle is commonly employed for this effect.
2. Inadequate penetration causes smoke more particularly in open-chamber engines of the non-turbulent, or quiescent, type. It may be presumed that fuel never reaches the air which is more remote from the nozzle tip.
3. Some engines are very sensitive to uneven or improper dispersion of the spray or sprays. In the case of pintle-type nozzles a great variety

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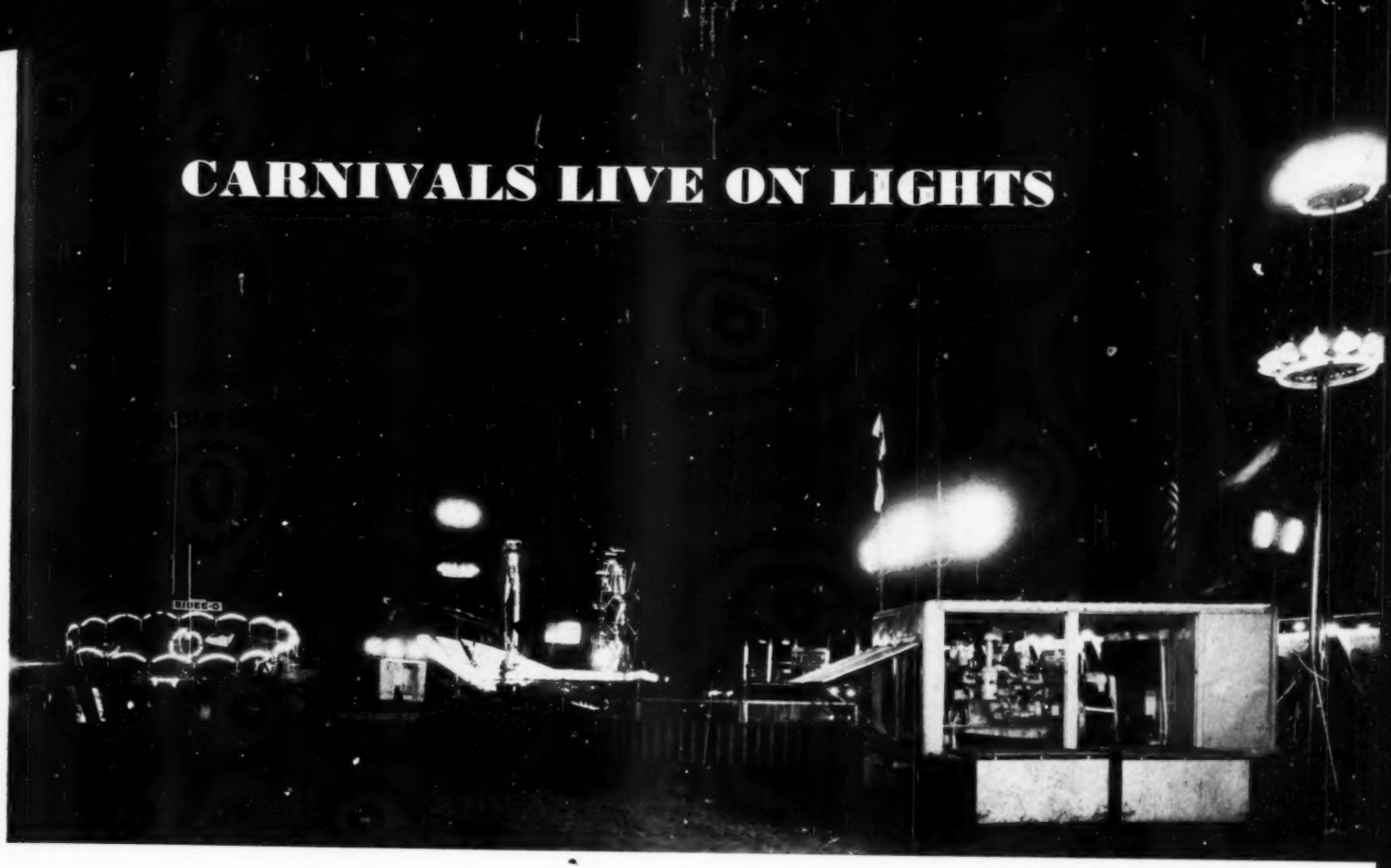
CARNIVALS LIVE ON LIGHTS



The barker's call, the raucous yells, the roar from the motordrome—all the noise peculiar to the fabulous carnival midways covers up the soft muffled drone that signifies Diesel engines at work. Up above the gleaming midways, huge searchlights send out bright invitations to throngs of fun-seekers.

AND do these invitations get answered? You bet they do! Crowds gather and gawk at these displays of night-time glamour and daylight brightness—more light means more customers. Ever since the John Fabick Tractor Co. of St. Louis, Mo., a distributor for "Caterpillar" Diesels, sold the first Diesel to light the midways in 1937 to Sol's Liberty Shows, they have lived on lights.

The carnival power story hinges on more than merely attracting crowds and lighting the midway, however. "Fabick" has sold "Caterpillar" Diesel Electric Sets to more than twenty-six road and train carnival shows; and, for the most part, these shows use their own electric sets to power searchlights and floodlights, the heavy rides, the lights for the ticket and cashier's wagon, and the lights in the circle of show and concession tents and booths. Royal American Shows even uses electricity to heat their snake pens. Happy hisses instead of woeful, chilly looks emanate from the warm, constant-temperature pens.

Train shows serviced by "Fabick" include such as Cavalcade of Amusements, Royal American, Hennies Bros., Wonder Shows, and Johnnie J. Jones Shows. Before these shows began using their own Diesels the selection of a site for the show was even more of a painstaking task. After the shows had found the right location of the right size and shape with the proper slope to the terrain, they had to worry about where their power would come from. Sometimes power lines were nearby, but most of the time they weren't. Usually, the shows had to order poles set up and transmission lines strung to the best site. Many times that "best site" had to be abandoned because of the heavy power cost it involved. Now, this last worry about power lines is a thing of the past—these shows carry their power plants "under their arms."

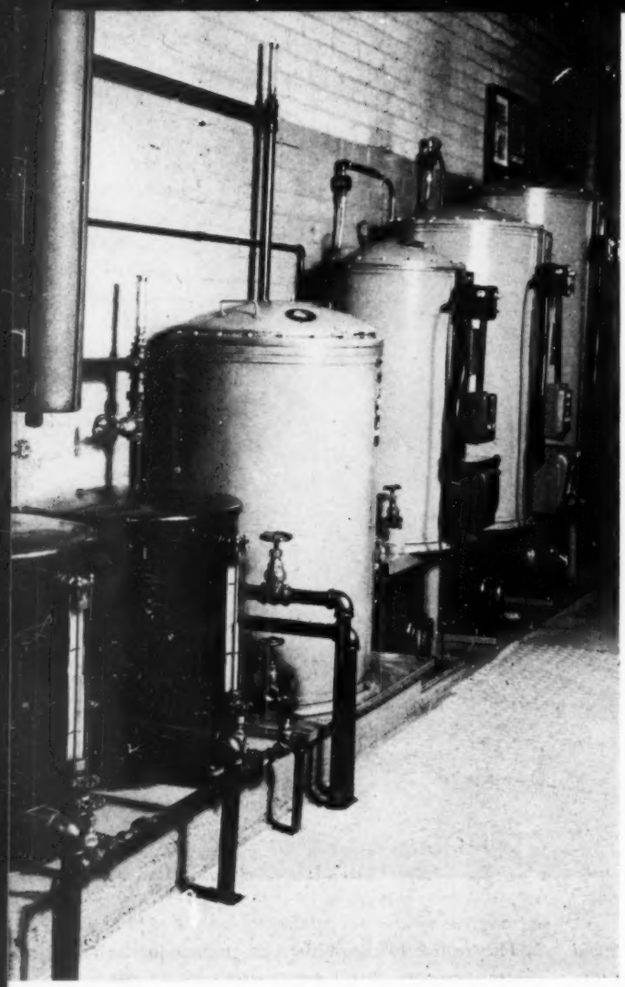
They're free to choose the best grounds for their setup—grounds that heighten the piles of dimes and rapidly shrinks the rolls of tickets in the wagon with the window out front.

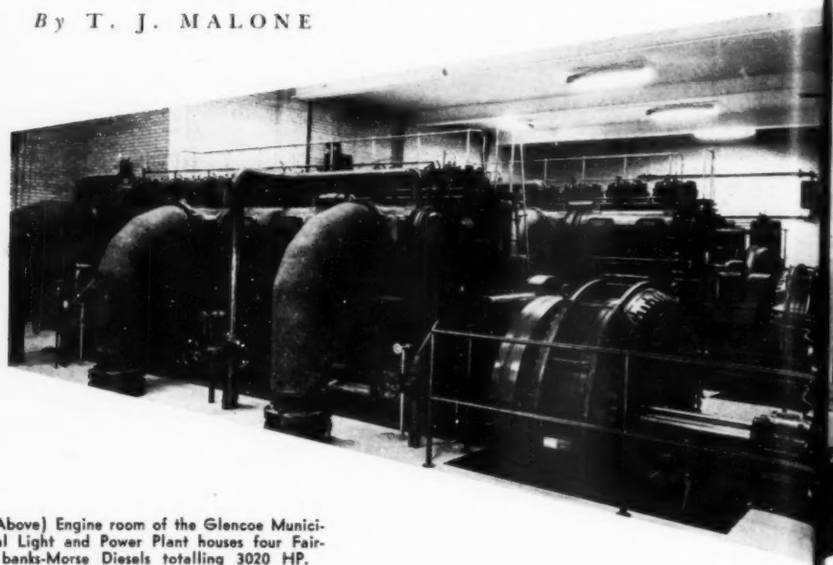
"Fabick" has pioneered in supplying road shows with Mobile Diesel trailers since 1939; today, these trailers have evolved as a streamlined, efficient, economical source of power. Chrome is plated on the various parts of the trailer and the electric sets wherever possible—there's plenty of "flash."

Interested by-standers view the compact Caterpillar Diesel used to supply lights for the Royal American Show.

GLENCOE, MINNESOTA..

By T. J. MALONE





(Above) Engine room of the Glencoe Municipal Light and Power Plant houses four Fairbanks-Morse Diesels totalling 3020 HP.

(Left) Three Honan-Crane oil reclaimers are in alignment along the wall in plant.

RECENT expansion of the power building and generating equipment in the municipally-owned Diesel electric plant in Glencoe, Minnesota, has caused that city of 2,600 people to become somewhat of a Mecca for persons "going to see." Besides the home folks, the goers-to-see are from other communities that plan to install, or add to, similar power plants. For Glencoe's handsome and spacious building, on amply landscaped grounds, with its modern equipment, offers a model of how to do it.

An addition completed in the fall of 1947, doubling the main section, gives the plant a 92x54 foot engine room. All four Fairbanks-Morse Diesels—3,020 hp., are in line and there is space for two more engines. A new 32x20 foot cooler building of matching brick, behind the main structure, houses three evaporative coolers, also of Fairbanks-Morse make.

In the plant's nine full years of operation, on a fiscal year basis, April 1 to March 31 inclusive, generation rose from 1,278,600 kilowatt hours in 1938-39 to 3,623,500 in 1946-47. Generation costs each year through the period averaged less than nine-tenths of a cent a kilowatt hour. The lowest average for a year was three-fourths of a cent.

Output of energy has averaged higher than 11.7 kilowatt hours to a gallon of fuel oil in all years, and higher than 12.2 kilowatt hours in four years. The high was 12.81 kwh. in 1945-46.

In the year ended March 31, 1947, the plant took in $97,730 from net energy sales, incurred $46,901 in operating expense and had an accumulated surplus of $116,000.

A privately owned steam plant which had served electricity to the community from 1899 gave way in 1925 to high-line utility service on a 20-year contract. In January, 1938, however, the city began operating a plant of its own, Diesel powered, and for the next seven years ran along with the utility service, assuming the full community load in August, 1945.

The municipal plant started out with two F-M Diesel units, of combined 750 hp. and 500 kw. capacity. It added a third unit of 900 hp. and 622 kw. in December the same year. The fourth, eight cylinders, 1,370 hp. 964 kw., was put in operation in April of 1946.

A summary of plant performance by full fiscal years, and for the first half of 1947-48, follows:

Fiscal Year	Gross Kwh. volume	Kwh per gal. of fuel oil	Average Reserve per Kwh.	Peak Load, Kw.	Rated Kw. Capacity
1938-39	1,278,600	11.72	3.63 cts	....	1,122
1939-40	1,549,700	11.72	3.10	....	1,122
1940-41	1,813,300	11.77	3.49	....	1,122
1941-42	1,982,900	11.74	3.42	....	1,122
1942-43	2,108,100	12.25	3.29	650	1,122
1943-44	2,260,200	12.34	3.18	720	1,122
1944-45	2,401,500	12.67	3.21	720	1,122
1945-46	2,971,600	12.81	3.17	810	1,122
1946-47	3,623,500	11.87	3.09	1,000	2,086
1947-48 (6 mos.)	1,820,600	12.39	...	910	2,086

Marked increase in generation volume in the later years reflects the plant's assumption of the full community load. Maximum generation in a 24-hour period was 13,300 kilowatt hours.

The drop in average energy output per gallon of fuel oil in 1946-47 is accounted for by the fact that the new Diesel was run for many hours at low load factor. In the first six months of the following year, the output average rose to 12.39 kwh. per gallon, indicating the plant's batting punch when that engine swings its weight.

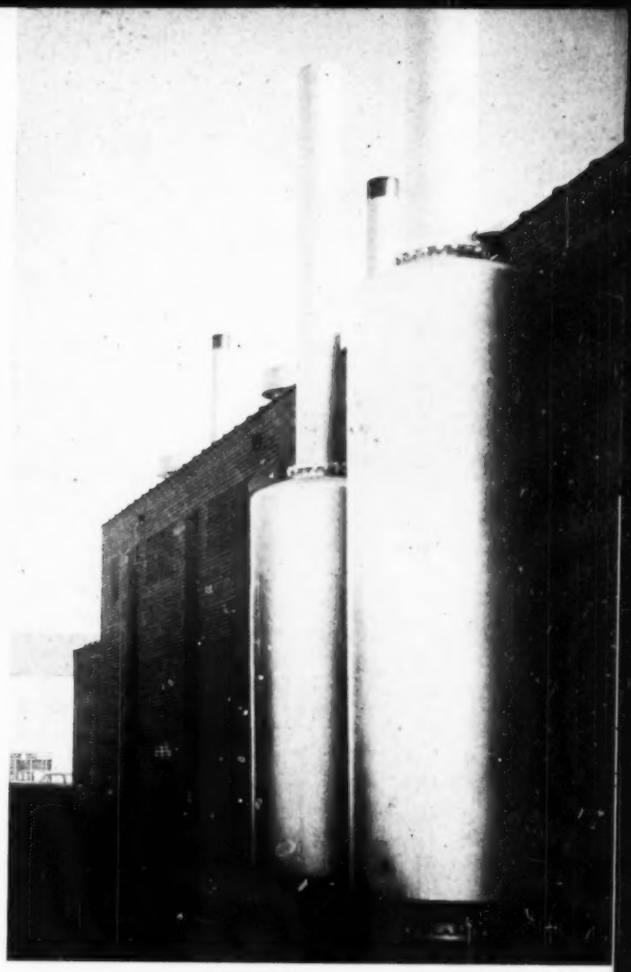
The decrease in the average revenue per KWH. sold indicates a building up of the consumption in the lower rate brackets. This, however, is offset by the improved running load factor on the generating sets with corresponding lower cost of generation per kwh.

In the summer of 1947, Superintendent Alfred R. Kephart, to cope with rising fuel oil costs began buying crude oil instead. By centrifuging the crude in a Gould purifier and passing it through a Honan-Crane filter, ridding it of dirt and water, he found the product very suitable.

In the four months, June to September inclusive

Municipal Diesels Thrive on Filtered Crude Oil

(Above) The municipal electric light and power plant of Glencoe, Minnesota, attractively designed in amply landscaped grounds.



Silencer equipment includes three Fairbanks-Morse and one Burgess exhaust snubber.

the plant consumption was 97,250 gallons of the processed oil. That 12.39 kilowatt hours to the gallon suggests that the oil had something.

Overall investment in the municipal electric system—valuation without depreciation—stood at $355,648 on March 31, 1947, all financed by bonds and earnings. That total covered everything: land, buildings, Diesels and other heavy machinery, other equipment and distribution system. The plant had paid from its earnings a total of $167,866, as of that date. Outstanding bonds amounted to $187,000, of which $132,000 were in revenue certificates, the last maturing in 1953, and $55,000 were in obligation bonds, maturing in 1958.

The plant has rather specialized in surpluses. It paid for the new addition from surplus, that is, earnings—just took that $18,000 or so out of its pocket instead of borrowing it. Also, the plant forked over about $34,000 from surplus to apply on the new Diesel unit. That wasn't all, either. The cost of the cooler house was paid out of pocket too, from surplus. So too the cost of a steel warehouse for line material and of a 15,000-gallon fuel storage tank. Up keep and expansion of the distribution system from year to year has been paid out of earnings—about $10,500 in 1946-47, about $9,500 the year before, and so on back. Monthly rates to consumers charged by the municipal plant are the same as at its beginning; they have never been changed. A comparison of the private utility's pre-Diesel rates with those of the municipal plant, for residential lighting and power, follows:

Residential	
Utility (before Diesel)	Municipal plant
9 cents a kwh for 20 kwh;	6 cents for 40 kwh;
8 cents for the next 20;	3.5 cents for 50;
7 cents for excess.	2.5 cents for 50;
	2 cents for 200;
	1.5 cents for excess.
Power	
5.5 cents for 50 kwh;	5.5 cents for 200 kwh;
5 cents for 50	4.5 cents for 300;
3 cents for excess.	3 cents for 1,500;
	2.5 cents for 2,500;
	2.25 cents for excess.

For commercial lighting, the utility charged the same schedule as for residential. The municipal schedule for commercial lighting runs: $1.00 for the first 10 kilowatt hours or less; 7 cents a kwh. for the next 40; 5.5 cents, next 100; 4.5 cents, next 350; 2 cents, next 1,000; 1.5 cents, excess.

Principal users of power are a flour and feed mill, a co-operative creamery, two hatcheries, two concrete tile and block factories, a branch knitting works, a fabrication plant making wagon parts, hoists, trailers and the like.

Superintendent Kephart believes in looking after his engines, with overhaul of each after every 3,000 hours of running time. The year after the new eight-cylinder engine began operating, to bring the other three up to its standard after nine years of service he had four pistons rebushed and crankshafts realigned in the two oldest engines. These were the most important repairs since installation.

Distribution of energy by classes of consumers in the latest fiscal year, ended March 31, 1947, showed residential lighting in the lead, general power second, and third—not commercial lighting as one might expect—but water heating. These are the totals:

Residential	935,653	kwh.
Power	765,931	
Water Heating	671,429	
Commercial Light	649,549	
Street Lighting	149,816	
Street Lighting	149,816	
Commercial Heat	26,835	
Station power and line loss	404,242	
	3,623,500	kwh.

Glencoers are great users of hot water. The Kephart forecast had it that the current year's volume for water heating would be around 1,000,000 kwh. At the going rate of one cent a kilowatt hour, the plant is delivering those kilowatt hours at a loss, but what can the plant authorities do about it? A passion for hot water is not to be discouraged or treated harshly.

At the outset of the Diesel regime there were consumers who preferred to stay with the competing utility. Two winter storms did much to convince them of the advantages of the municipal plant's service. The storms, one in 1940 and one in 1943 and both in November, each lasted three days. In the 1943 storm, of about sixty customers of the utility who applied to the municipal plant for help, twenty-one had its service run to them. The relief pleased them so greatly that nearly all chose to stay on as regular customers of the city plant. For this special permission had to be, and was, obtained from the War Production Board.

NEW CARGO-PASSENGER VESSEL

Hoegh Silvermoon-440 ft. 8,100-ton Diesel Ship Built for Norwegian Interests

By GEORGE D. CROSSLEY

IN the M/S *Hoegh Silvermoon*, the owners, Leif Hoegh & Co. A/S have again made a valuable addition to their fleet. The ship is built as an open shelterdeck vessel to Det Norske Veritas' class 1.A.1✠ and has the following principal dimensions:

Length overall	440 ft. 8½ ins.
Length p.p.	415 ft. 0 ins.
Breadth moulded	56 ft. 0 ins.
Depth moulded to main deck	28 ft. 7 ins.
Depth moulded to shelter deck	37 ft. 6 ins.
Draught	25 ft. 9⅜ ins.
Deadweight	8,100 tons
Speed on loaded trial	17.18 knots

There are four holds and one deep tank for oil cargo arranged under the main deck, as well as five shelter tweendecks. The total capacity of the holds is 482,500 cu. ft. grain and 427,400 cu. ft. bales, and of the deep tank, 41,850 cu. ft. grain and 38,900 cu. ft. bales. Rat proofing of the vessel has been arranged. A provision-room including refrigerated chamber for meat, fish and vegetables is located on the shelter deck amidships. The double-bottom extending from forepeak bulkhead to after peak bulkhead, is divided into six tanks arranged for carrying water ballast or fuel oil. The total capacity is 973 tons of oil.

The rigging consists of two masts and four Samson posts. There are ten five-ton, four three-ton and one one-ton derricks as well as one five-ton derrick to serve the engine-room.

The deck machinery consists of twelve three-ton and two five-ton winches, one five-ton capstan, windlass and steering gear, all electrically driven and manufactured by Thomas B. Thrige.

A CO_2 fire extinguishing system for the holds is installed, complying with the rules of the Board of Underwriters of New York for vessels carrying cotton as cargo.

The accommodation of the officers and crew is very comfortable and nicely executed. The crew's accommodation comprising a spacious recreation room is located in the after part of the vessel, partly under the upper deck and partly in the deck-house. The cabins aer all arranged as two-berth cabins. In the deck house amidships are the officers' cabins, messroom and smokeroom, and furthermore special messrooms for seamen and motormen.

Passenger accommodations are located in the deck house on the promenade deck. There are eight cabins, with adjoining bathrooms, for twelve passengers, as well as spacious and nicely furnished saloons. On the boat deck is the captain's house comprising dayroom, bedroom and bathroom for the captain, and in the wheelhouse, the wireless station and cabin for the wireless operator.

All the cabins are provided with natural ventilation and steam heating. The vessel is equipped with a gyro compass, auto pilot and echo sounder.

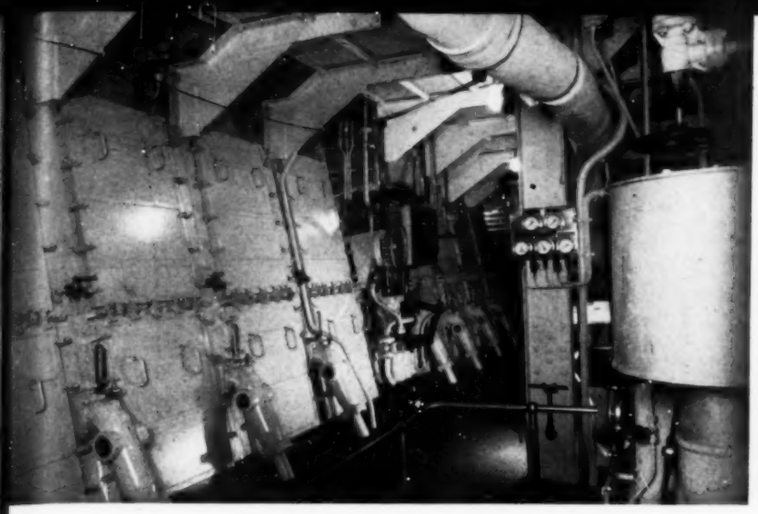
The machinery was built to *Det Norske Veritas*. One Burmeister & Wain direct reversible, single-acting, 2-stroke, 9-cylinder crosshead engine with airless injection, cylinder diameter 620 mm., stroke 1150 mm. Normal output 6300 ihp., corresponding to 5150 bhp., at 140 revolutions per minute.

This engine type is one of the results of the development which took place before the war in regard to B&W 2-stroke engines, and the engine, which essentially corresponds to the B&W standard designs, has in two principal points been a model of the single-acting, 2-stroke crosshead engines. In accordance with B&W practice the rotating scavenging air pumps are fitted on the rear side of the engine which arrangement gives the shortest possible engine.

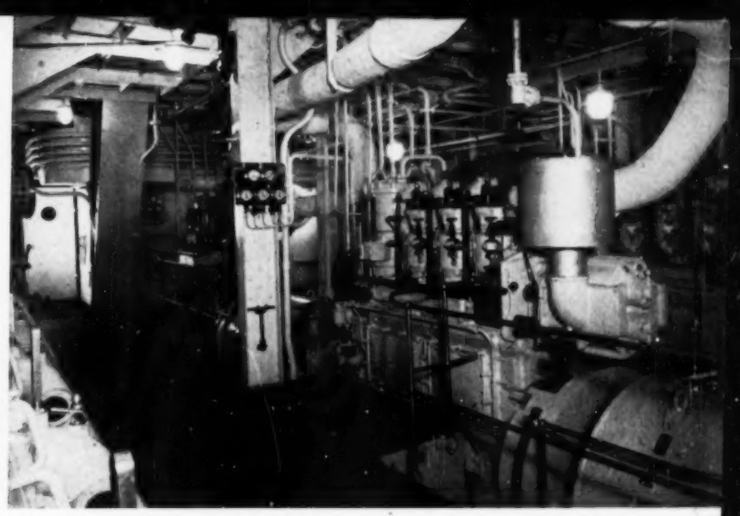
The engine is built with short pistons and cylinder liners giving the least possible height of the engine and retaining the pure crosshead principle that cylinders and crankcase should be kept apart.

Three single-acting, 2-stroke, 3-cylinder trunk piston engines with airless injection, each direct coupled to a generator of 120 kw. at 220 volts. The Diesel cylinders have a diameter of 220 mm., a stroke of 370 mm., and an output of 180 bhp. per engine at 400 revolutions per minute.

All large pumps for the main engine are vertical centrifugal pumps, direct coupled to electromoters



Maneuvering platform for main engine two stroke, nine cylinder, crosshead Diesel built by Burmeister and Wain.



Auxiliary Diesels aboard *Hoegh Silvermoon*. Three of these 2 stroke, 3-cylinder, develop 180 hp. each at 400 rpm.

by resilient couplings. There are two lubricating oil pumps, each having a capacity of 190 cu. m. per hour at a pressure of 3.5 at., further two sea-water cooling pumps, each having a capacity of of 210 cu. m. per hour at a pressure of 2.1, at., and a fresh-water cooling pump having a capacity of 210 cu. m. per hour at a pressure of 2.1 at.

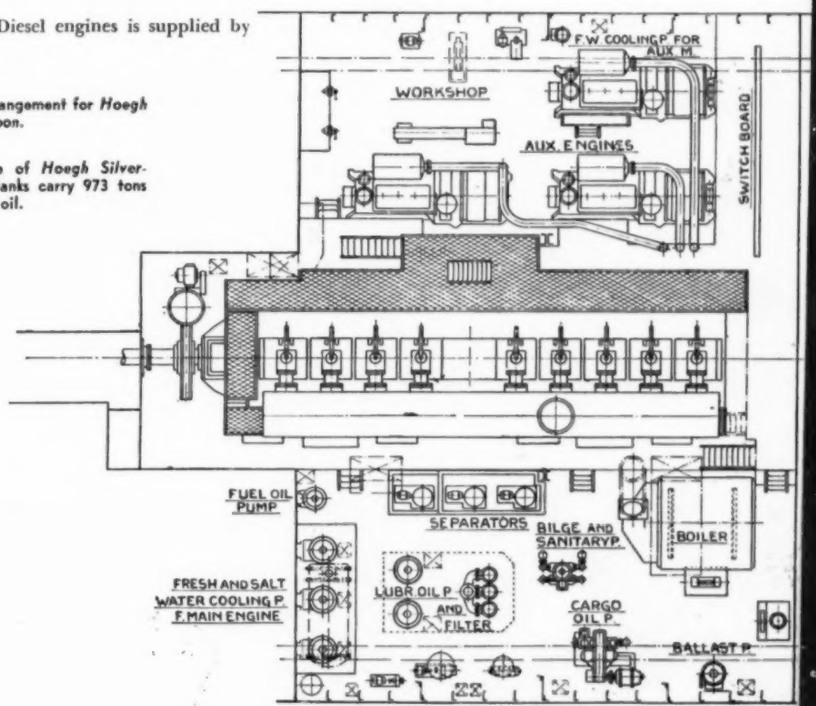
The auxiliary engines have a common fresh-water pump of 25 cu. m. per hour, to be used in port. The lubricating oil is drawn from the bottom tank beneath the main engine; it is discharged through the filter and lubricating oil cooler of pistons, partly for lubrication of bearings, whereupon it flows back to the bottom tank. There is an oil cooler made of steel plate and having cast iron covers, tube plates of brass and tubes of yellow metal, and furthermore a fresh-water cooler of the same type. The fresh water pump draws from the main engine and discharges through the fresh-water cooler back to the main engine. The system is closed, and in the casting an expansion tank of abt. 1 cu. m. is fitted. The sea-water cooling pumps draw from the sea and discharge through oil cooler to fresh-water cooler and over board.

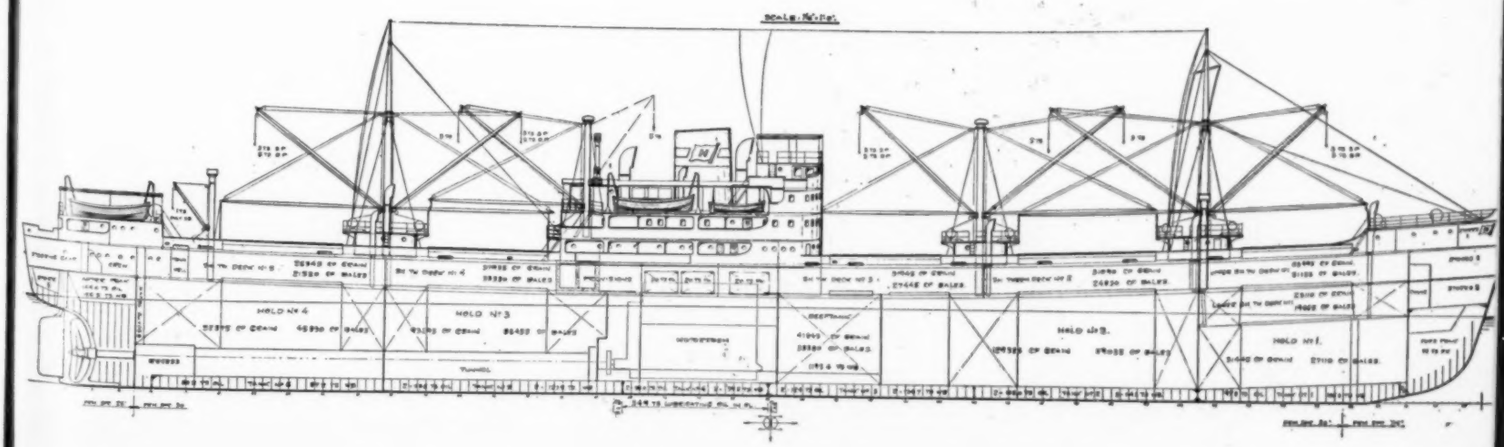
Of other pumps there are a vertical, self-priming centrifugal pump of 150 cu. m. per hour, acting as ballast pump, a 2-cylinder plunger pump c. 2 x 20 cu. m. per hour, acting as bilge and sanitary pump, and a gear-wheel pump of 20 cu. m. per hour at a pressure of 3.6 at., acting as fuel oil transfer pump.

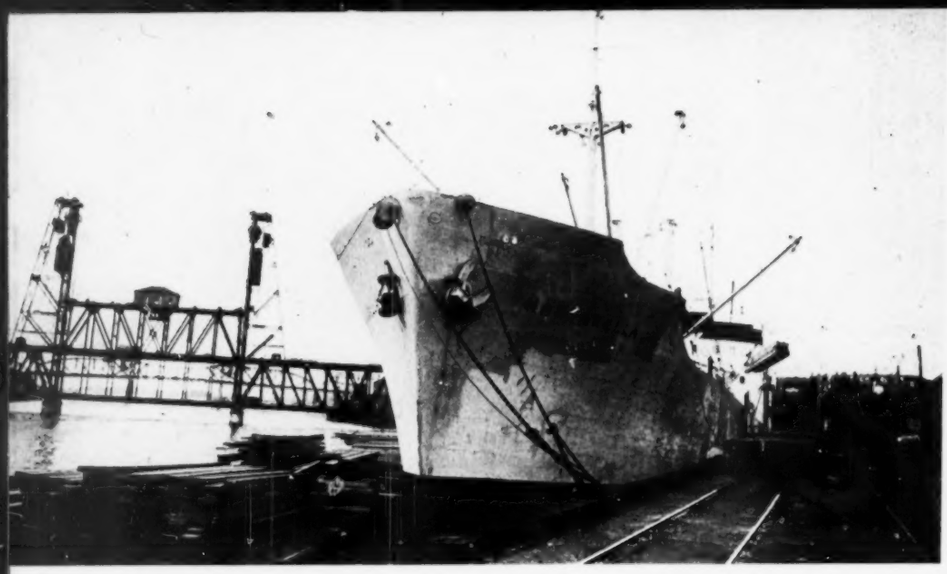
Starting air for the Diesel engines is supplied by three 2-stage manoeuvring air compressors, coupled to the auxiliary engines. There are two starting air receivers, each having a capacity of 8 cu. m. at a pressure of 25 at.

(Right) Engine room arrangement for *Hoegh Silvermoon*.

(Below) Inboard profile of *Hoegh Silvermoon*. Double bottom tanks carry 973 tons of fuel oil.





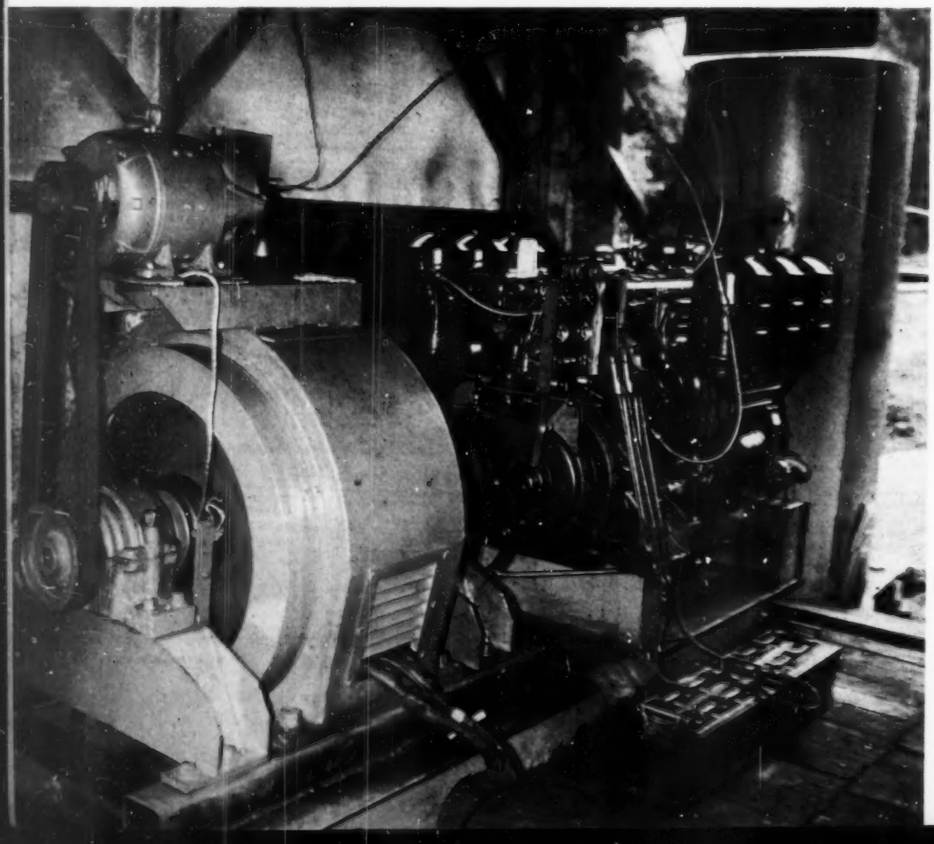


Diesel Ship *Mangarella* loading lumber at East Portland, Oregon. She is a 9,200 ton Swedish Line ship. Her engines are Burmeister and Wain.

(Right) Fallers undercutting a medium-sized Douglas fir. This is practically the only logging operation which is not Dieselized.

(Above) Southern Pacific Diesel locomotive hauls lumber to dock at East Portland. It is General Electric built and powered with a 240 hp. Caterpillar Diesel.

(Below) Twin General Motors Diesel furnishes power for electrified saw mill at McMinnville, Oregon. Happy Valley Lumber Company speeded output with Diesel.



ALL THE WAY WITH DIESEL

A Picture Story of Lumbering In The Pacific Northwest

By F. J. CLIFFORD

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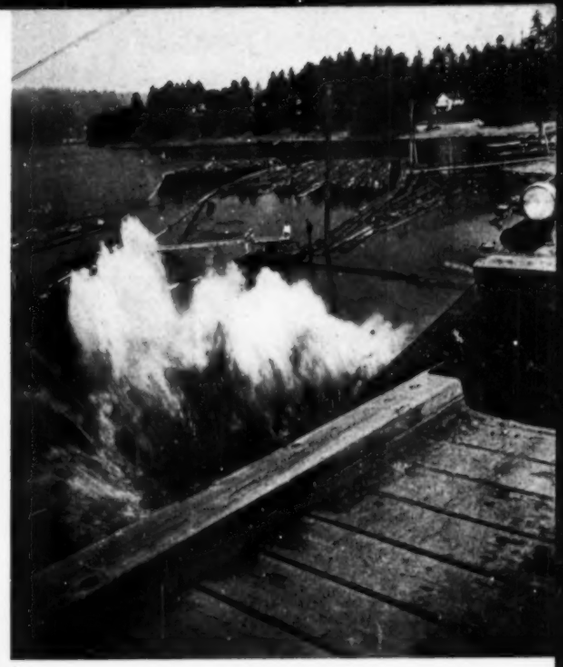


(Above left) Cletrac tractor powered with 200-hp. General Motors Diesel using Carco arch in operation.

(Left) Big Kenworth logging truck, Cummins-engined with 150 hp. arrives at Milwaukee, Oregon after a 56-mile mountain run with 4000 feet of Douglas fir.

(Above) Douglas fir log (see left) hits the water after being lifted off truck. Logs are then boomed and towed by Diesel tugs to the sawmill.

THE steady progress of animal and mechanical power in the manufacture of lumber is still a very much untold story. It's a long haul from the whip-sawed boards and timbers of pioneer days when with one man standing atop the log and one in a pit below, turned out the home and ship building materials of those horny handed days. But the rising cost of labor has just as steadily eliminated the use of manpower until today we find Diesel dominating the forest bound sawmill in many sections of our land.

From the pine woods of the Atlantic coast to the vast fir and redwood forests of the Pacific coast hinterland, timber has played a mighty part in our economic lives. In pioneer times, the big job was getting rid of the trees for the growing of farm crops. Here on the Pacific coast, the mere size of the tree and its attendant stump was a herculean task. Near waterways where logging started, six foot diameter trees were the rule, many larger. They were felled with axes, the fallers standing on spring-boards, two boards high which would mean that the stump would be about a man's height. This practice came about because the wood at that height would chip out easier than lower down. Some prideful fallers, to hold king-pin standing, would go four boards high.

Skids made of small straight trees were laid on the sloping ground. The big logs were rolled along these with hand-jacks, the upper part fitted with a spur that bit into the rough bark when the ratchet lever was worked. With a fast helper, a jack log-roller would keep the big stick moving steadily until it splashed into water where it was easily handled.

As the demand for lumber increased, oxen and logging-chain took over from the jack log-rollers. With five to seven or more yoke bull-team, the logs were dragged across the short skids which were kept greased, save on downhill grades where they were sanded to keep the log from coasting onto the plodding oxen.

The faster and willing horse served briefly in the interlude between ox and steam donkey logging. The last regulation team of logging oxen was used on the Smith river, a few miles above Reedsport, Oregon in 1917. But the rising cost of labor finally eliminated the steam donkey. Logging outfits discovered they could fly barrels of oil over lofty treetops to Diesel power donkey at far less cost than the wages of fuel wood-choppers, fireman, water pump and pipe man and a spark chaser during the fire season. Timber value alone of the two logs and cross pieces making up a steam donkey sled would amount to a full $600. A Diesel donkey sled would not cost a third of that amount and could be moved easier from spar-pole to spar-pole and of course would wear much longer.

After the tree is felled, it is bucked into log lengths suitable for hauling. If it's to be hauled over a public road, the log must be bucked short enough so as to not exceed 5000 scale feet which approximates the legal limit on highways which is 54,000 lbs. on three axles and twelve tires of logging trucks. On privately owned logging roads, it is trucking equipment limit.

Diesel tractors of the crawler type are used to yard in the logs at many a show. A sky-line rigged between two spar-poles bring the logs to the loading landing where a loading donkey takes over and swings the logs to logging trucks or railroad cars. Logs at the landing are picked up by logging tongs which are but an enlarged edition of the iceman's tongs.

Equipped with dual transmissions, the Diesel trucks can swing the huge logs along at a forty mile clip or with compound gears, lift them over mountain ranges on a fifty or more mile haul.

Drilling Records Set With Diesels

THE Rocky Mountain Drilling Company recently established several new records in oil well drilling. First is the drilling of California's deepest oil exploration well near Ventura, which at present is 17,600 feet underground and second is the record for continuous drilling operations. Six heavy-duty Diesels, four Superiors, and two General Motors have been in constant operation for over seven months. Third, only three engine oil changes during this entire period: One at the end of the first 1500 hours, one at the end of 3100 hours and the latest, after 4800 hours for an average of about 1600 hours between oil changes. During this gruelling non-stop push, engine checks indicated good performance, with better than average power output.

According to Roy C. (Buck) Carpenter, pusher for Rocky Mountain, the use of a Diesel fuel additive aided in establishing these records. In July 1947, when the company began the run Induco fluid was added directly to the fuel. This new additive produced by the Industrial Chemical Company takes immediate chemical action against the impurities in the average run of fuel oil, such as sulphur, gum and tar, breaking them down into compounds that will burn in the engine cylinder.

Carpenter, who has been associated with Rocky Mountain since 1934, stated:

"I have never before enjoyed the additional power needed to carry on the exploration through trying hours to depths heretofore unattained in California's oil drilling activities.

"With no sludge in the motors, the combustion attained with the use of Induco Fluid has helped make possible the seven months' uninterrupted operation of our Diesels with savings in operating cost and savings in fuel and oil.

"Our mechanic, Ward Grange, remarked at each of the three oil changes, 'It's a damned shame to throw away such clean oil.' "

Rocky Mountain Drilling Company's 17,600 ft. well near Ventura, California. Insert shows Roy G. Carpenter Company "Pusher".

Frozen Food Kept the "Diesel Way"

By DOUGLAS SHEARING

CONSIDERING the thoroughness with which small, light weight, high speed Diesels are making their appearance in so many industries and businesses, large and small, in big towns and in out of the way country communities everywhere throughout the nation, one wonders sometimes whether the developments of this type of power really had any idea of the terrific demand for these small but powerful engines, or of the multitude of uses to which they could be adapted.

For instance, we have the Trinity Valley Cold Storage Co., in Liberty, Texas. Liberty is a city of perhaps 4500 population, with a history of interest and importance in the days of the fight for Texas freedom. The city is on U. S. Highway 90, about halfway between Beaumont and Houston. Its location is by no means out of the way, nor is its population in want of good electric service, but the Trinity Valley Cold Storage Co. gets its current from its own Diesel generating sets for reasons readily explained.

J. C. Tucker, the present owner and manager, bought the ice plant in Liberty about three years ago, with a larger ambition than merely to sell ice. From his studies of trends of thought of the public and from all he could learn of the subject, he was convinced that the modern cold storage locker plant is a proposition of much promise, just as practical for a small town as for a large one.

In the second year of his management, therefore, he installed his locker plant, composed of 509 lockers, 60% of these will hold 200 lbs. of frozen meat or other foods; 40% are larger and have a 250 lb. capacity. He found that his community caught on very quickly to the locker idea, and that the word of his plant was spreading until his customer list included people from Goose Creek, Beaumont and even Houston. City customers are finding it profitable to buy beef, poultry and other foods in the country and have them frozen and stored right there; Mr. Tucker's location—halfway between two sizeable cities is, in fact, ideal.

(Above) The Trinity Valley Cold Storage Company plant, Liberty, Texas; J. C. Tucker is owner and manager. Plant has 509 lockers altogether.

(Below) Close-up of one of the three 80 hp. General Motors Diesel Units, which supply electric power for refrigerating compressors.

With his business growing, Mr. Tucker had his eye out for dependability. A cold storage plant must, of all things, be absolutely dependable; a locker plant, serving hundreds of small customers, must be able to assure them of uninterrupted electric power.

So Diesel generating sets went into the Liberty locker plant. These were General Motors Diesel units, with General Electric generators, the units being standard production with no special accessories, furnished complete by Stewart and Stevenson Services, of Houston, Texas. This firm, probably the largest G-M Diesel distributor in the entire country and with a large marine Diesel business, also specializes in industrial generating sets and this Liberty job is typical of many installations made by Stewart and Stevenson.

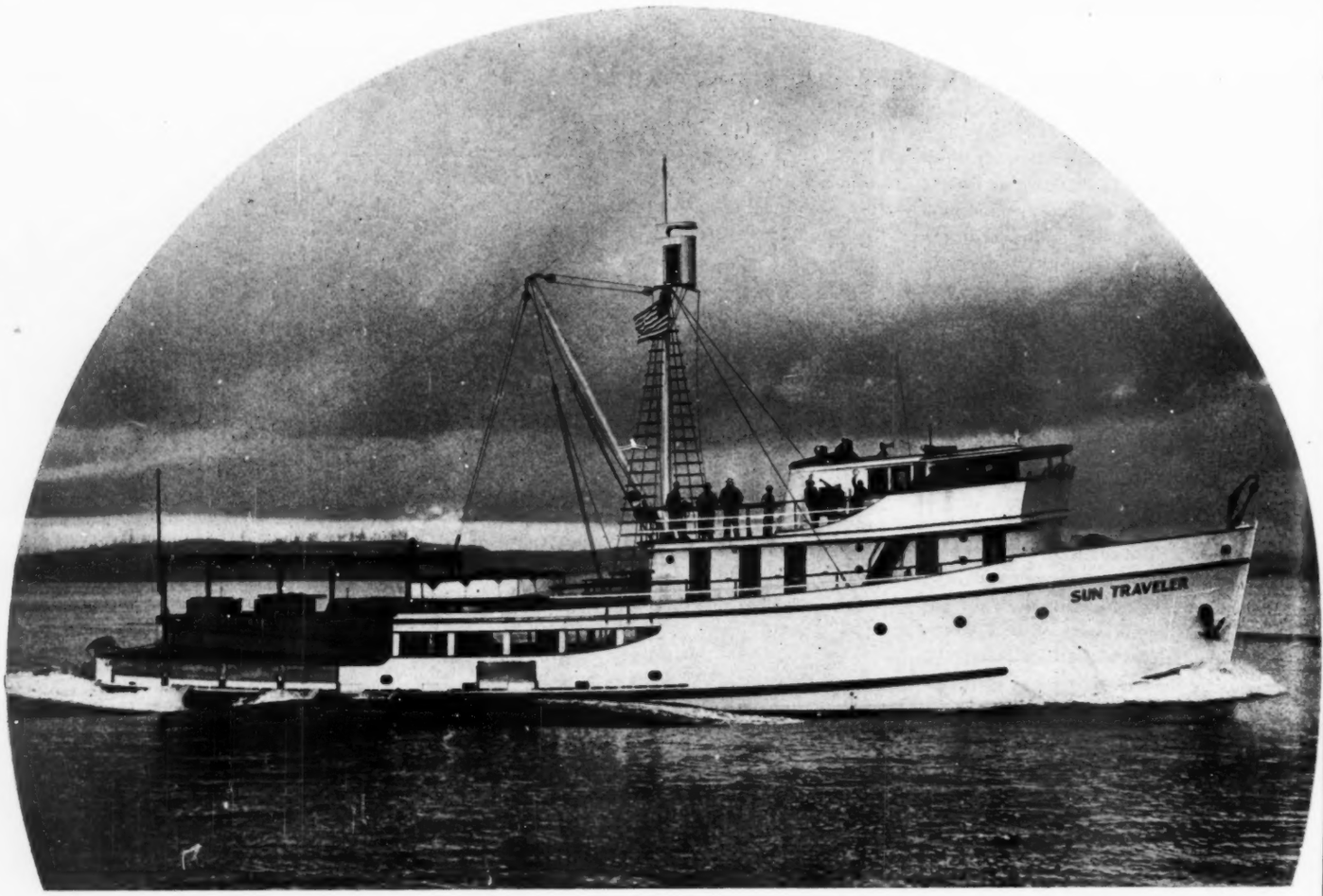
There are three engines, fully synchronized. Each is a Series 71, General Motors Diesel, of 4 cylinders, developing 80 hp. at 1200 rpm. for continuous service. The generators attached to each engine are of 45 kva. rating. Equipment is standard, with G-M fuel injection and A-C fuel and lube filters. Cooling is by radiator.

The engines, says Mr. Tucker, installed in April, 1946, after a year and a half of operation use no more oil now than they did when first installed. Humble lube oil is used, and is changed every 150 hours of operation.

Machinery for the plant includes one 9 in. by 9 in. Frick compressor, driven by a 50 hp. electric motor; one 5 in. by 5 in. York compressor, with a 15 hp. motor; one 4 in. by 4 in. York, with a 10 hp. motor, this compressor being used for maintaining the temperature of the ice vault, chilling room, and for operation of the air conditioner in the firm's office; one 4 in. by 4 in. York, also with a 10 hp. motor, a self contained unit on the fore cooler, for ice can water; one 4 in. by 4 in. York, for locker room temperatures, with a 5 hp. motor; and a 3 in. by 3 in. York with a 5 hp. motor for the quick freeze room.

A temperature of 22 below zero is maintained in the quick freeze room; the locker room is held from zero to five degrees above; the room for chilling and aging is kept from 34 to 38 degrees above zero. The ice plant has a capacity of 21 tons daily.

For about six months out of the year—the summer months when the sun is hot—all three Diesels are operated 24 hours per day, except for the short time that an individual engine may be shut down for an oil change. Under this 24-hour system, Mr. Tucker says that the load is about 80% of full capacity. He could get by, he points out, with two sets, giving them a full throttle, but he gets a smoother operation by using all three.



SUN TRAVELLER . .

A 121-Foot Tuna Clipper For San Diego

By CHAS. F. A. MANN

LATEST of the all-electric, or rather all-Diesel electric tuna clippers to join the Pacific tuna fishing fleet is the clipper *Sun Traveler,* completed in January at the plant of Puget Sound Boat Building Corporation, Tacoma, for a syndicate headed by the Sun Harbor Packing Co. of San Diego, Messrs. John Brescovich and J. J. Petrich of Tacoma and Captain Ralph McCabe, skipper of the new vessel.

Sun Traveler is the latest of a long line of successful fishing and commercial vessels from this busy yard, practically 100% of which are of wood and Diesel design. Plans for the vessel, which is 121 ft. x 27 ft. 4 in. x 17 ft. 8 in. loaded draft, were prepared by James J. Petrich, son of John Petrich of the Puget Sound Boatbuilding Corp. Everything that goes into an expensive, long-range bait-type tuna clipper was incorporated into the design, including a few experience-tested ideas for Southern waters. They line up as follows—each an outgrowth of practical experience in fishing farther and farther south toward the waters off Chile, and are as follows:

1. A sun visor-canopy entirely around the "outside" pilot house . . . also protection against sudden hot, tropical showers that come up and go away quickly.

2. Use of public address system even to the crow's nest where the lookout spots a school of tuna any minute.

3. Elimination of costly inlaid linoleum flooring in all crew's spaces, and substitution of magnesite cement flooring laid wet on wire mesh.

4. Piping of all 12 bait tanks below the main deck for temporary fuel oil storage in case a daring skipper wants to go 2,500 or 4,000 miles South of its home port and back without refuelling. Enormous auxiliary storage is thus provided up to 200,000 gallons, so the ship can go outbound loaded to full draft with fuel and gradually replace the fuel reserve with frozen tuna. Such fuel capacity in a 121 foot ship is unheard of.

5. Use of multiple unit, lightweight, compact Diesel auxiliary generator sets to provide constant A.C. power and lighting current without batteries or starting air compressor Diesel units.

6. Use of one of the most powerful two-day radio installations ever put on a fishing vessel—a 1,000 watt set capable of world range under favorable conditions.

7. Use of bronze and oak for rudder construction in place of the conventional plate rudder subject to electrolytic deterioration, as well as stern bearing fittings and hardware, including bolts and spikes, and a Tobin bronze tailshaft. The ship is virtually electrolysis free throughout.

8. Use of a full scale Sperry gyrocompass and automatic pilot almost exactly like those used in transatlantic liners.

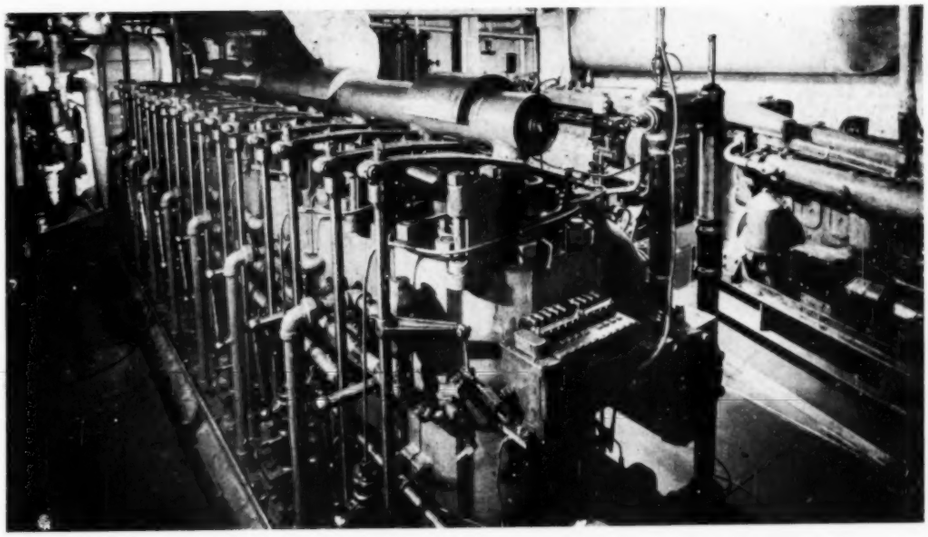
9. Elimination of the traditional Philippine mahogany interior trim, and in its place, the use of Puget Sound poplar finish. The current abortive costs of the imported mahogany are knocked at least 50% by the use of poplar trim.

10. The fitting of a 33 mph. speedboat on the upper deck for quick runs ashore, ahead or behind, as well as conventional dingy and the oar-powered skiffs.

11. Elimination of refrigerators for the galley and substitution of two full-size walk-in refrigerated compartments for adequate food storage for the whole voyage right next to the cook's table.

Evolution of the Pacific Coast tuna clipper is constant and rapidly finding itself down to minute details that formerly were overlooked or given third place in the layout of the ship as though they did not exist.

Capacity is 260 tons of frozen tuna in 12 bait wells on the lower deck and 3 bait box compartments on the main deck. Two of the bait tanks are steel plate lined for regular storage of fuel on the outbound voyage, and the remaining below decks tanks, 10 in all, are tight-caulked wood and paint finished, piped for both brine and fuel oil storage in case of need. When used as temporary oil storage, they are washed down after emptying and cleaned with a special detergent before storing the hard frozen fish.



Sun Traveler's trim engine room with 8-cylinder Washington Diesel with self-contained compressor and pumps. Manzel lubricator shown. G.M. Diesel at right—one of 3 installed.

Regular fuel capacity is 30,000 gallons in the forward and aft main fuel tanks, and 1200 gallons of lube oil in two grades—one for the main Diesel and one for the light auxiliary Diesels. From 150 to 200,000 additional gallons of fuel and lube can be carried temporarily in the bait wells if conditions require.

Main propulsion is an 8 cylinder 4 cycle Washington Diesel engine, fresh water cooled, with self contained pumps and air compressor for starting, driving an Olympic 3-bladed bronze propeller 82 inch diameter and 57 inch pitch, via a Tobin bronze tailshaft, 7 inches in diameter.

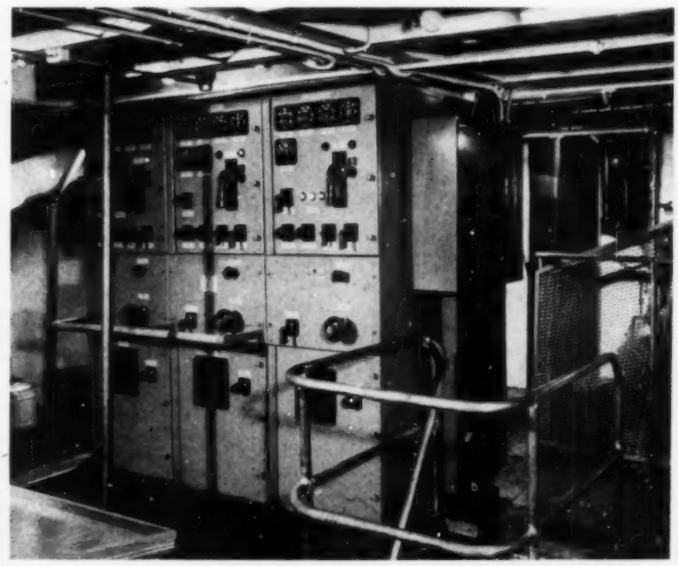
Auxiliary power requirements demand a large, automatic, foolproof system, especially if you have 250 tons of tuna valued at $600 per ton aboard, in the tropics, and the outside temperature is in the high 80's or over 100 at noontime.

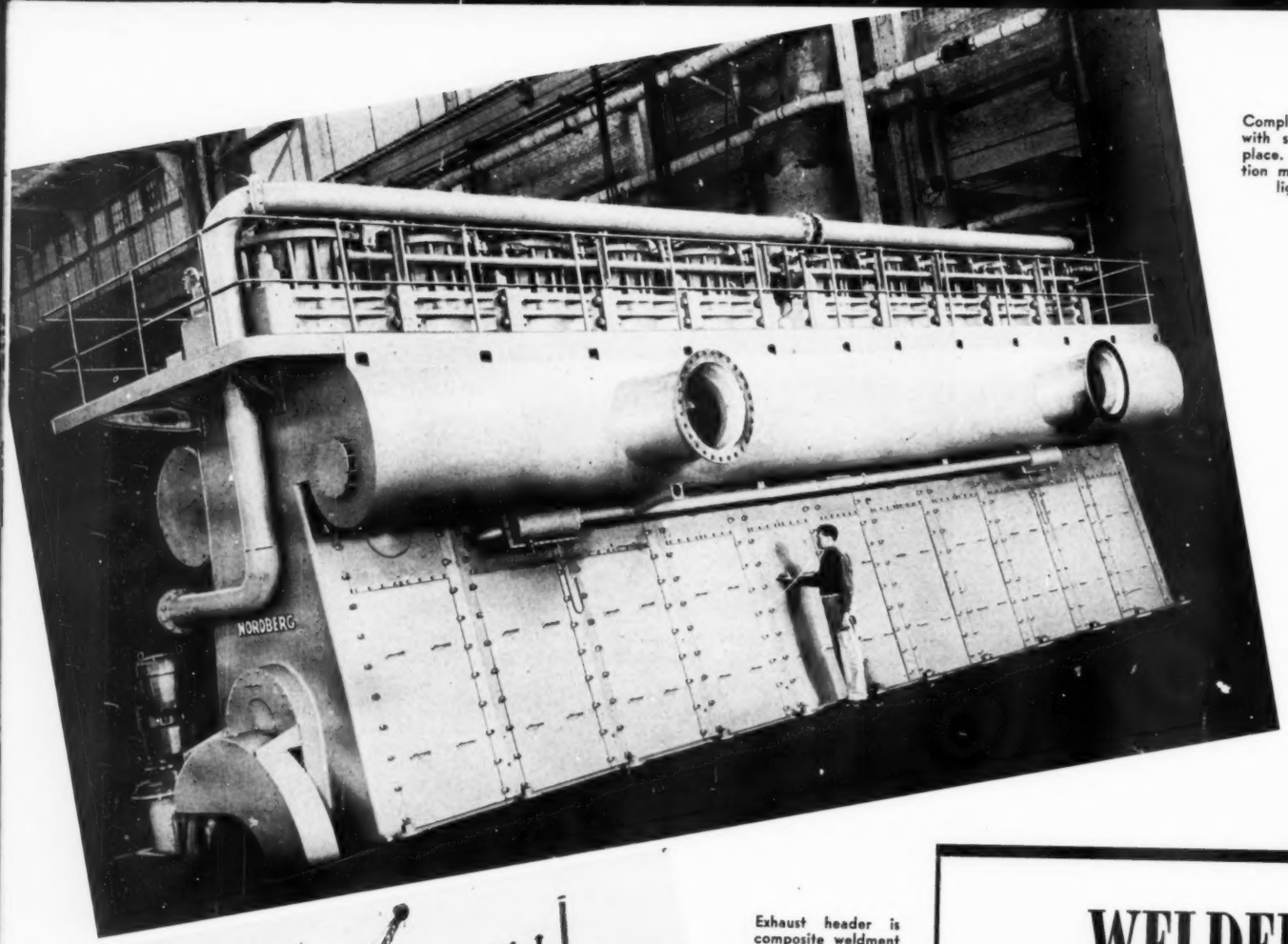
Three six cylinder 125 hp. General Motors Diesel sets are fitted, each driving a 60 kw. 110 volt Bardco A.C. generator. A 12 volt self-contained battery-generator-starter system is fitted on each set. A small electric air compressor is fitted to get starting air supply for the main Diesel.

Cooling water for the auxiliary Diesels heat exchangers and the ammonia condensers is supplied by the elaborate pumping layout below, most of it strung out in the shaft alley which runs between the fish tanks.

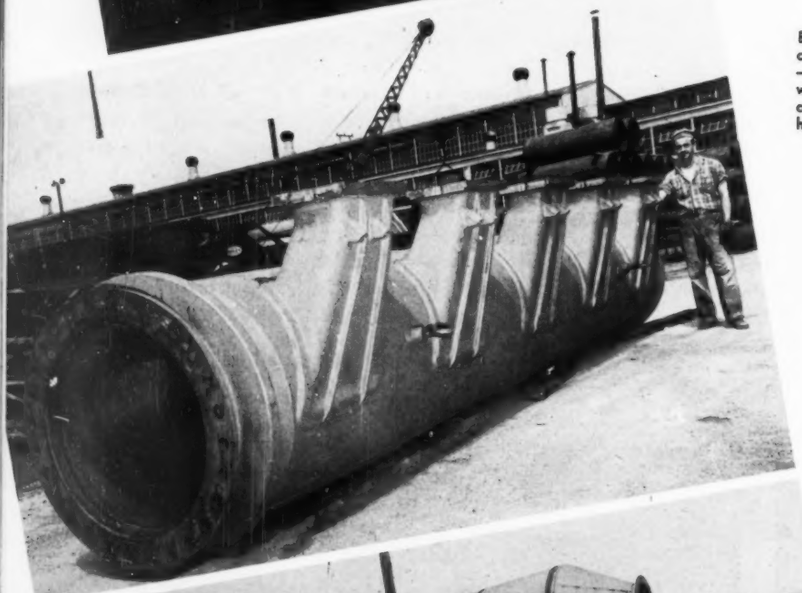
Pilot house view showing Sperry gyro-compass and automatic pilot. A Submarine Signal Co. fathometer is also installed.

Main control panel aboard *Sun Traveler* controls output of three General Motors Diesel auxiliaries.





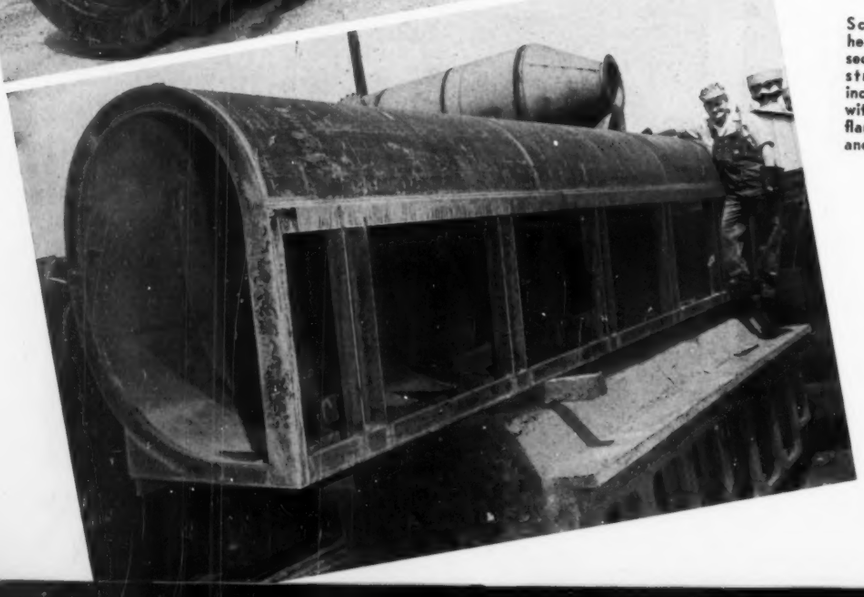
Completely erected Die with scavenger header place. Welded constru tion makes for strong l light installations.



Exhaust header is composite weldment — steel plate pipe with steel nozzle castings. Half of header shown in illustration.

WELDED CONSTRUCTION FOR LARGE DIESELS

By HAROLD E. BAILIE*



Scavenging air header (one of two sections shown) constructed of 5/16 inch plate, welded, with ¾ and 1-inch flanges at the ends and a longitudinal frame.

THE design of the largest single acting Diesel engine ever produced in the United States incorporated the combined usage of castings and weldments. This engine, built by the Nordberg Manufacturing Company in 1947, was a ten-cylinder unit with a bore of 29 inches and a stroke of 40 inches. It will operated at a normal speed of 164 rpm. At this speed the rating is 7100 bhp. when driving its 5,000 kw. generator. The engine is a two-cycle, single-acting crosshead type with mechanical fuel injection. Scavenging air is sup-

* *Welding Supervisor, Nordberg Manufacturing Company.*

plied to the engine by a separate motor driven centrifugal blower.

The bedplate is cast in two sections of the sill type. Large welded sump pans are attached between the cross members of the sill frames. The combined use of weldments and castings reduced the weight and complexity of the bedplates.

The sump pans (Figure 3) are composed of bar stock and plate. The shell of the pan proper and the angles and channels are bent to shape on a press brake. All of the material parts are then set up and sequence welded so that the resultant pan is straight and oil tight. The attaching bar stock frame is of sufficient thickness to be machined to match the face of the sill frame. Four pans are required for the engine; two of them are approximately 8 feet long, and the other two, approximately 11 feet long.

The cylinder blocks are individual castings with removable cylinder liners. On opposite sides of these are attached the scavenging air headers and exhaust headers. The scavenging air header is an example of eccentric section. Structural strength and rigidity are demand of this unit which carries air at a low pressure from a blower to the cylinders. The scavenging header (Figure 1) was made up in two sections, and the total length when bolted together was 40 feet. The thin 5/16 inch plate wall constitutes more than one-half of the circumference of a circle having an outside diameter of approximately 51 inches. The section modulus of this plate section is very rigid in nature and is unaffected by air pressure pulsations. On the ends, this part of the section is supported and held in place by heavy ¾ and 1 inch flanges, which are torch cut to the section modulus of the header. This thin section is also welded in the longitudinal direction to a frame consisting of bar stock and press formed channels. The rib members support the long shell section and decrease possible diaphragm action. Extra thickness is allowed in the bar stock frame to supply finish material for subsequent machining operations.

The platform plate and toe board sections are tacked in place and the entire structure is sequence welded, air tight with an established procedure. The back perspective view of one half of the scavenger header is shown on the opposite page.

The exhaust header is a composite weldment, using steel plate pipe and steel nozzle castings for attachment to the cylinder blocks (Figure 2). The steel pipe is 40 inches in diameter and is 5/16 inch thick. Very often turns are necessary which carry out three or more parallel center line dimensions. The nozzle castings are thrown off the vertical center line of the pipe and set upon a line parallel in order to fit the header underneath the platform. The headers are designed to take the exhaust to two water jacketed pipes which are connected to the silencers. These units are custom built for each job and as welded design is easily adaptable, any requirements typical of any layout are feasible. The headers are welded to operate gas tight at about 500° F.

In addition to the specific weldments discussed the engine required many other weldments such as: air headers, oil headers, fuel lines, guards, covers, breathers, waterjacketed exhaust piping, tanks, and other direct and auxiliary parts.

Editor's Note: This paper was made available to DIESEL PROGRESS by the James F. Lincoln Arc Welding Foundation. M. Bailie received a Lincoln welding award for this work in welding development for Diesel construction.

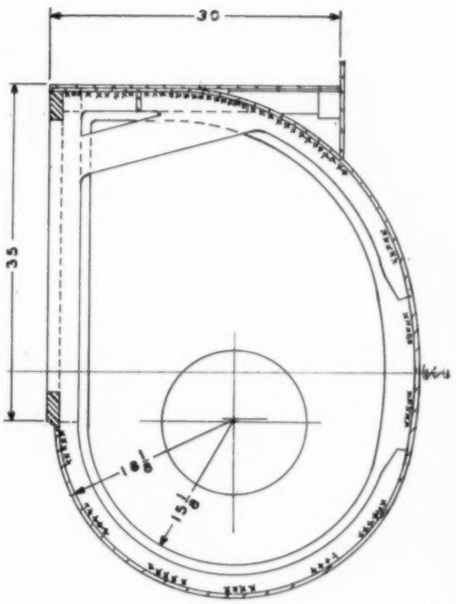


Figure 1. Cross section of scavenging header showing construction details.

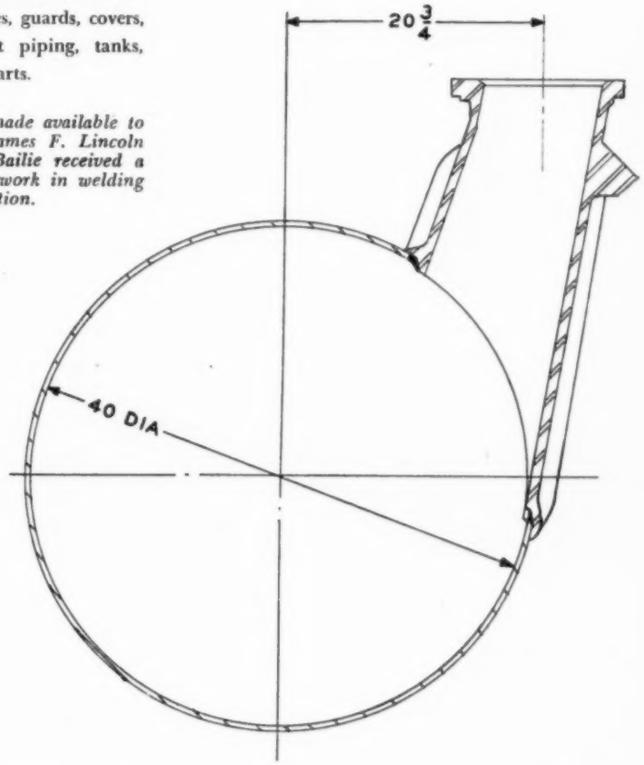


Figure 2. Cross section of exhaust header showing steel plate pipe with steel nozzle castings welded in place. Header is welded to operate gas tight at 500° F.

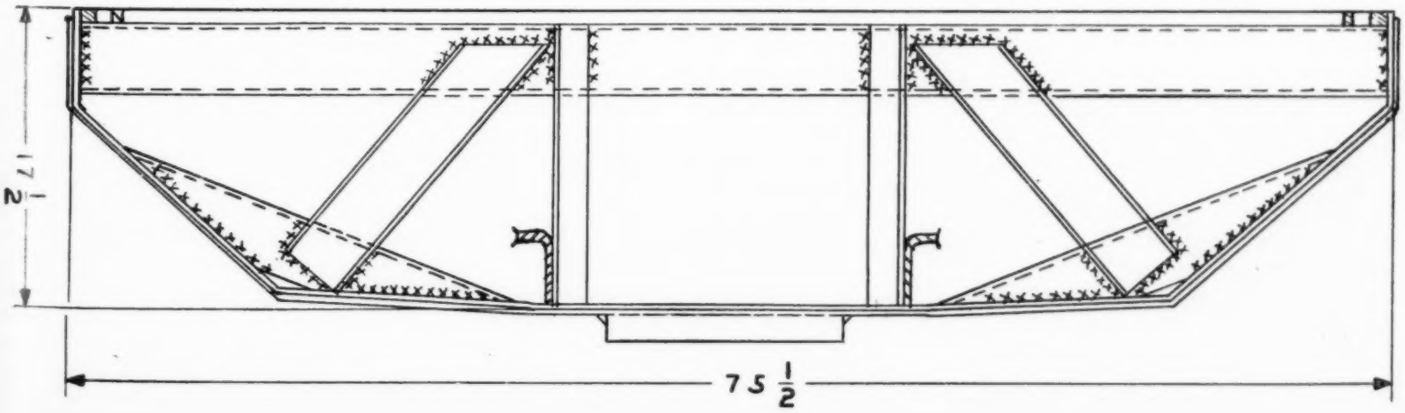
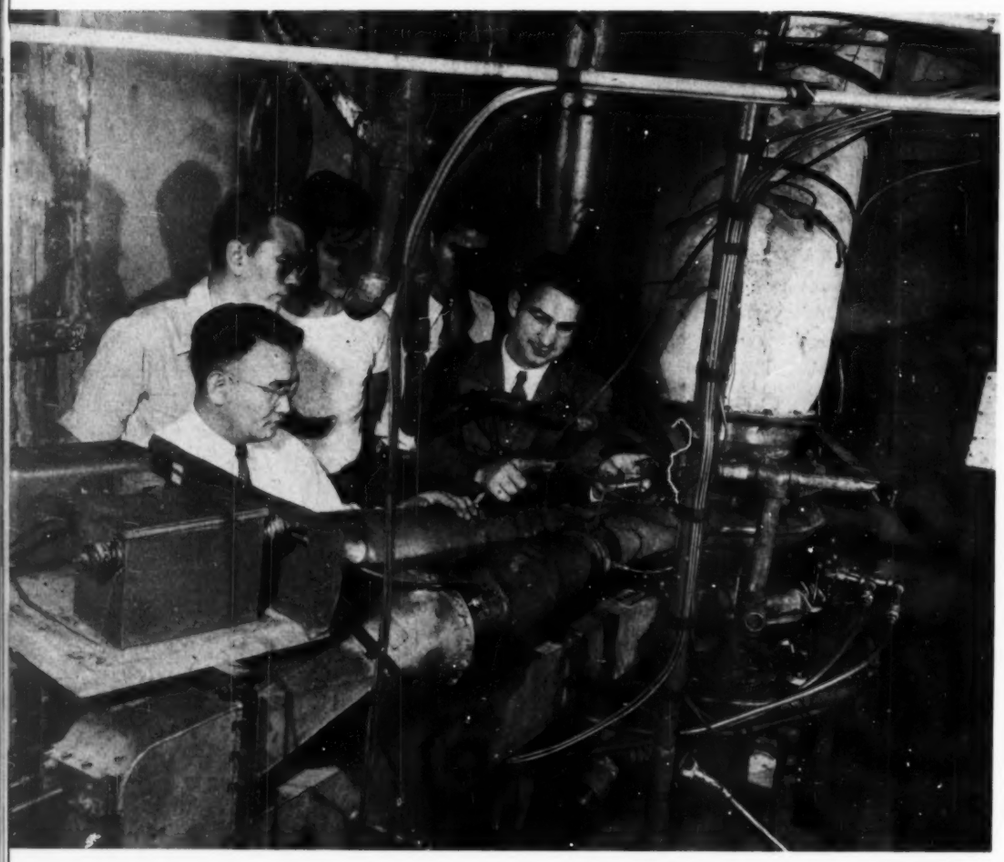


Figure 3. Sump pans for big Diesel are constructed from bar stock and plate. Pans are shaped by means of a press brake then welded oil tight.

"TAKING THE TEMPERATURE" OF SUPERCHARGER ROTORS



University of Wisconsin engineers check apparatus for testing supercharger temperatures.

By JIM LARSEN

AN aircraft turbo-supercharger of the type used to "boost" bombers in World War II to heights of 40,000 feet and more has been reconverted and is now on the University of Wisconsin campus for peacetime research to develop new and better fuels and superchargers for combustion engines.

University engineers, led by Phil Myers and Otto Uyehara, assistant professors, are attempting to find the operating temperature of the rotor—the inner spinning fan of the supercharger—and to study the combustion which forces the rotor to speeds of 22,000 revolutions per minute and over.

To minimize the danger should the supercharger explode while travelling at such tremendously high speeds, the gas turbine—as it is called—has been placed in a laboratory constructed of ten-inch reinforced concrete walls with two thicknesses of boiler plate across the heavy wood door. While in operation the scientists observe the turbine with the aid of a mirror and with a control panel located outside the concrete "cell."

Originally designed under the pressure of wartime research, scientists built the superchargers for aircraft without a complete knowledge of the temperatures existing within the unit—temperatures which are estimated to be in the neighborhood of 1500 degrees. To secure the information needed for greater operating efficiency, scientists must now attempt to "take the temperature" of the rotor and of the burning gas vapor within the supercharger.

To do this, Uyehara and Myers are using the electro-optical pyrometer, a device which they invented several years ago to learn the combustion secrets of Diesel engines. Based somewhat on the principle of an "electric eye," the pyrometer gauges the temperature of the rotor—or of the exploding vapor within the cylinder in the case of the Diesel—by measuring the intensity of light coming through a quartz "window" in the wall of the unit.

"The design difficulties are much tougher in the case of the gas turbine," declared Myers, "because the temperatures are much lower—and the light given off is therefore much less intense—and also because the 144 blades on the rotor pass the 'electric eye' at the rate of over three million per minute at maximum speed."

As a result the speed of the response made by the electric eye must be rapid—to understate the case—and at the same time a high amplitude must be secured.

"These two effects—high frequency and high amplitude—are mutually opposed," said Myers, "in the same manner as dim light and clear definition are mutually opposed in photography."

The scientists hope—but they're not too sure—that they will be able to overcome this engineering hurdle with the aid of modern electronic devices.

The research is being done on a grant from the Wisconsin Alumni Research Foundation, which also financed the work in the field of Diesel and gasoline engines, and the turbine was consigned to the University of Wisconsin by the Allis-Chalmers Manufacturing Company.

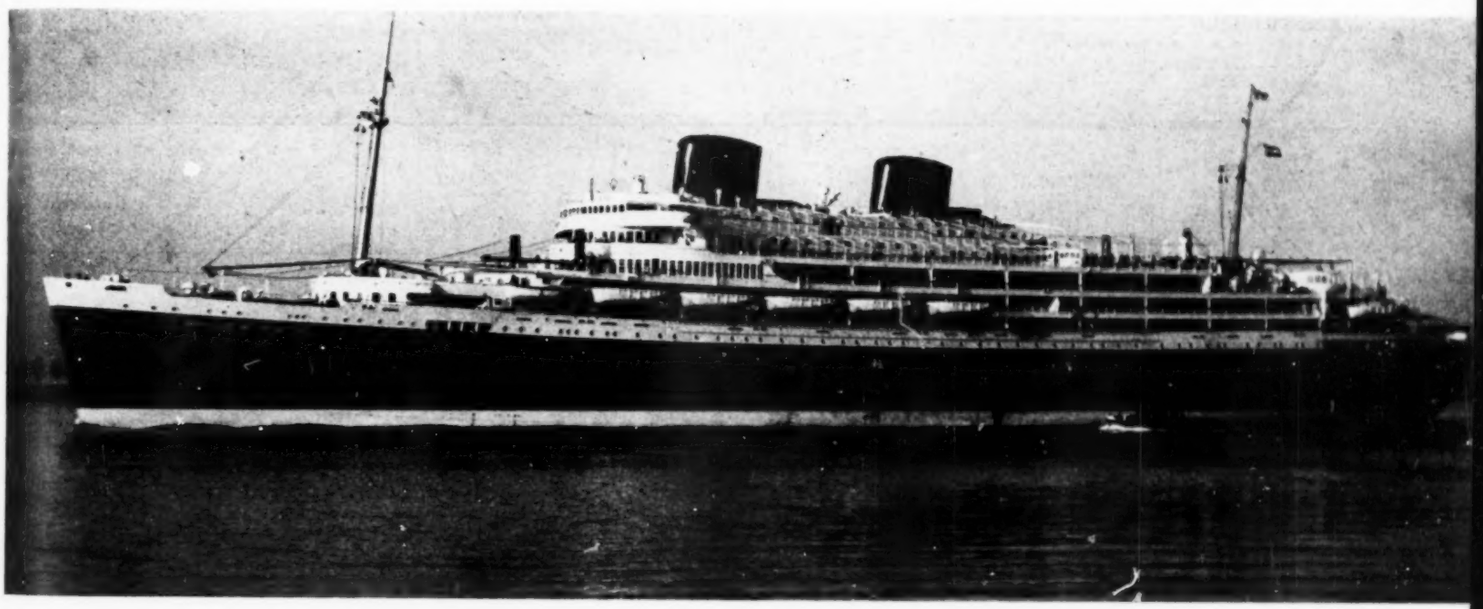
Myers and Uyehara refer to the gas turbine as a "boot strap" unit because the pressures built up by the compressor are sent full-circle back into the turbine. In aircraft the turbine, which is run by exhaust gasses from the engines, operates a compressor which boosts air pressure within the engines to sea level or above—necessary for the efficient operation of high compression engines used in modern high-altitude aircraft.

There is a limitation imposed upon the use of the supercharger in aircraft, however, because the rotor must be kept within certain speeds or it will explode like an ungoverned flywheel. A better understanding of the temperatures of different portions of the rotor blades will provide information to metallurgists and designers of not only superchargers but also jet propulsion engines, turbines for power generation, and railroad locomotives of the future.

Trials of the World's Largest Geared Diesel Propelled Ship

WILLEM RUYS

By HAMISH FERGUSON



THE author felt privileged in receiving an invitation to attend the trials of the new Dutch passenger liner *Willem Ruys* for it was an event of outstanding interest and importance to the Dutch Nation—equivalent to the return to passenger service of the "Queen Elizabeth" in the history of British maritime progress.

Behind the completion of the new 21,300 ton Dutch liner there lies a story of human endurance, loyalty and courage which can hardly have been surpassed in the annuals of world shipbuilding.

The order for the building of the ship—No. 214 as she was then designated—was placed in August, 1938, and construction commenced with the laying of the keel at the "De Schelde" shipyards, Flushing, in January, 1939. Completion was scheduled for 1941 and the hull was about ready for launching at the time of the German occupation of Holland. Not only was the hull nearly finished but also the greater part of the materials and fittings required for the completion of the ship had been manufactured and delivered.

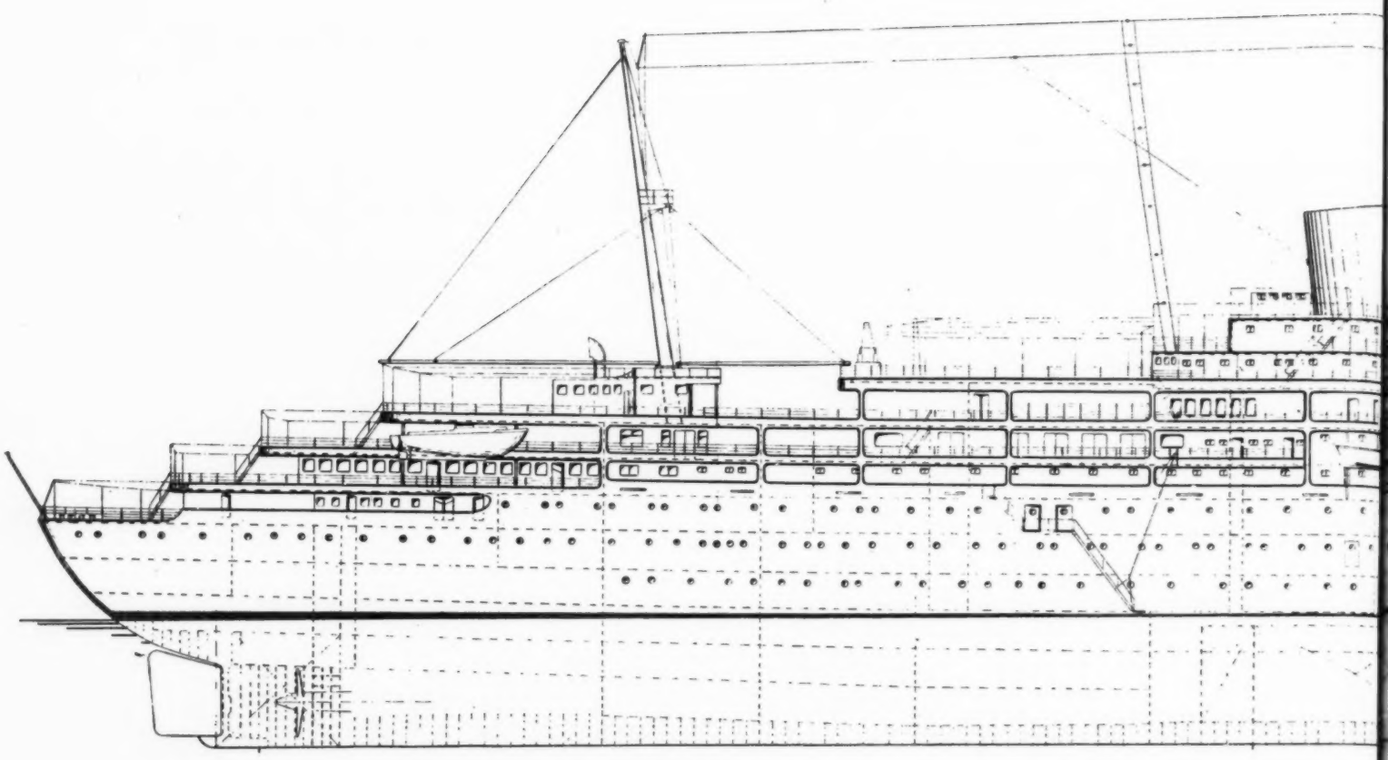
With the arrival of the German occupying forces the ship was allowed to become derelict, so far as the Dutch appeared to be concerned and, for reasons never explained, the Germans neither converted the hull for wartime uses nor did they destroy it. Subsequently the unavoidable aerial bombardment of Dutch ports by the Allied Air Forces laid waste to considerable areas; yet, still, the hull of No. 214 escaped, virtually unharmed.

The day inevitably arrived when the invader was forced to retreat and, once again, the Dutch were in control of their own country and very rapidly they succeeded in taking stock of their remaining assets. Outstanding among these was No. 214—an unfinished shell only, but capable of being transformed into a valuable profit-making concern in the interests of Dutch rehabilitation.

An urgent question arose—how could the ship be completed and what had happened to all the materials and fittings which had been assembled prior to the German occupation? These essential components had been distributed throughout Holland in small lots which might escape the enemy eye and Dutch patriots had concealed them in cellars, back-bedrooms, under hay-stacks and in pig-sties—in fact, in any place which the unimaginative German would not investigate. When these materials were again mobilized, it is an authentic fact that hardly a single item was missing, so jealously had they been guarded and concealed from enemy notice. This was the main factor which made possible the completion of the ship during the early stages of Dutch rehabilitation.

This preamble ends on a sad, though proud, note. Willem Ruys was the founder of the firm now bearing the name of Royal Rotterdam-Lloyd and his descendants have carried on the tradition. Willem Ruys was also the name of the joint head of the company who subsequently shared, with his brother, the responsibilities of management and development. Willem the second was shot as a hostage by the Germans. This new ship commemorates both pioneer and patriot.

Description of Trials. In all, some 650 guests em-



barked at Rotterdam on 15th November, 1947, to witness the technical and speed-trials of the ship and in addition there were aboard 450 crew consisting of Dutch senior personnel and native crew for less important duties.

Sailing from Rotterdam on 15th November, the route was by way of the River Maas to the North Sea where a gale was blowing. Though fairly high seas were encountered the ship behaved well and movement as not excessive. After entering the English Channel the wind abated and forecasts indicated smooth waters. It was decided, therefore, to carry out the official speed trials over the "Plymouth mile." Conditions were favourable and, in all, eight two-way runs were made to check the ship's performance at 18, 20 and 22 knots and to determine full speed. The official record shows that the ship achieved a speed of 24.6 knots whereas her designed service speed is 21 knots—the owners, the designers and builders and the visiting guests were unanimously agreed that the work put into the ship, both as regards general design and the propulsion machinery, was fully justified. Results proved that 27,000 shp. of geared Diesels could propel a modern liner of 21,300 tons with flexibility, competitive speed and comfort.

General Details. The hull is built in steel, rivetted construction being adopted rather than welding. In the superstructure and fittings a considerable amount of aluminum-alloy has been incorporated, this being necessitated by the shortage of steel in Holland during the period of completion when any available materials had to be employed if they would reasonably do the job and still be consistent with safety regulations and human comfort. These light alloys did not apparently give rise to undue vibration and, perhaps, the employment of such materials, the result of "force majeure," may create a precedent and promote a new outlook towards shipbuilding methods for the future.

Resulting from the adoption of utilizing eight main propulsion engines of comparatively small size to drive the twin screws by means of mechanical gearing and electro-magnetic shipcouplings, much overhead space has been saved and it was made possible to incorporate an additional passenger deck in the design. The length of the engine room is increased, of course, in comparison with the space required for direct-coupled engines but it is estimated that the increased earning capacity of the liner due to carrying a greater number of passengers will justify the selection of the multi-engined design—though overall fuel consumption may be higher than would be the case were direct-drive to be used, it is anticipated that maintenance costs will be reduced and that the ship need only be out of service during very short periods for purposes of engine overhaul.

Principal Ship Particulars

609 ft. 10 in. length between perpendiculars
82 ft. beam
54 ft. 9 in. depth to "A" deck at isde
29 ft. 2 in. draft
21,300 tons gross
7,500 tons D.W.
Service speed 21 knots
Propeller speed 125 rpm.

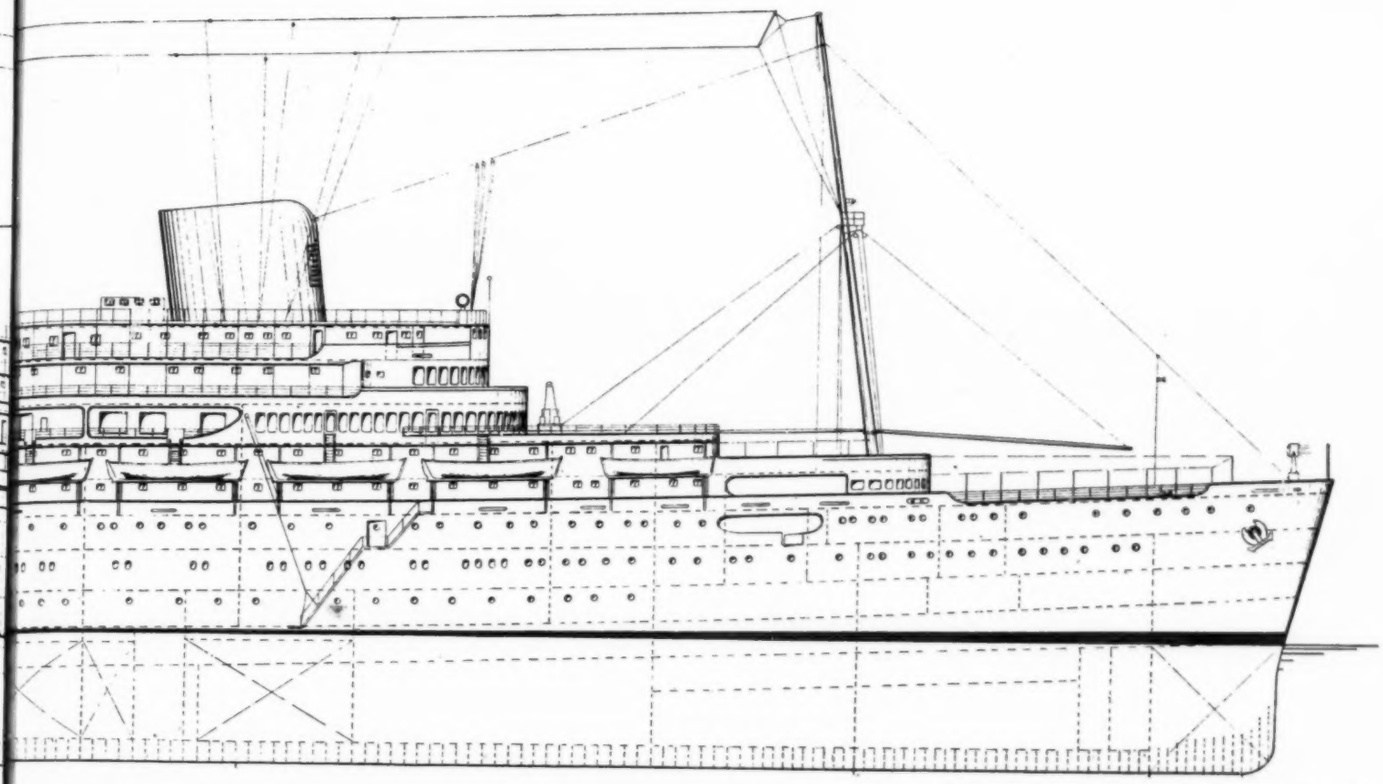
It will be seen from the illustrations that the ship has two funnels of somewhat unusual shape designed to ensure minimum wind resistance and to keep the decks clear from smoke under all wind and weather conditions. Both are working funnels and each contains an exhaust uptake from the engines, and a waste-heat boiler.

Main Engine Details. The main propulsion engines consist of eight single-acting, two-cycle mechanical injection cross-head type Sulzers having a bore of 580 m.m. and 840 m.m. stroke. The engines have eight cylinders and each has its own engine-driven scavenge pump. At the governed speed of 215 rpm. the normal output is 3,375 bhp. per engine, maximum output being 3,750 bhp. equivalent to a total output of 30,000 bhp. The designed service speed of 21 knots can be reached with only six engines in operation thus making it possible for engine overhauls to be carried out in rotation while the ship is at sea.

Propellor Drive. The engines are arranged in pairs and each transmits its power to an intermediate shaft through the medium of an electro-magnetic slip-coupling. The intermediate shafts are in turn connected with the propellor shafts through mechanical gear boxes and it is thus possible to transmit power to the propellor shafts using any combination of one to four engines per propellor.

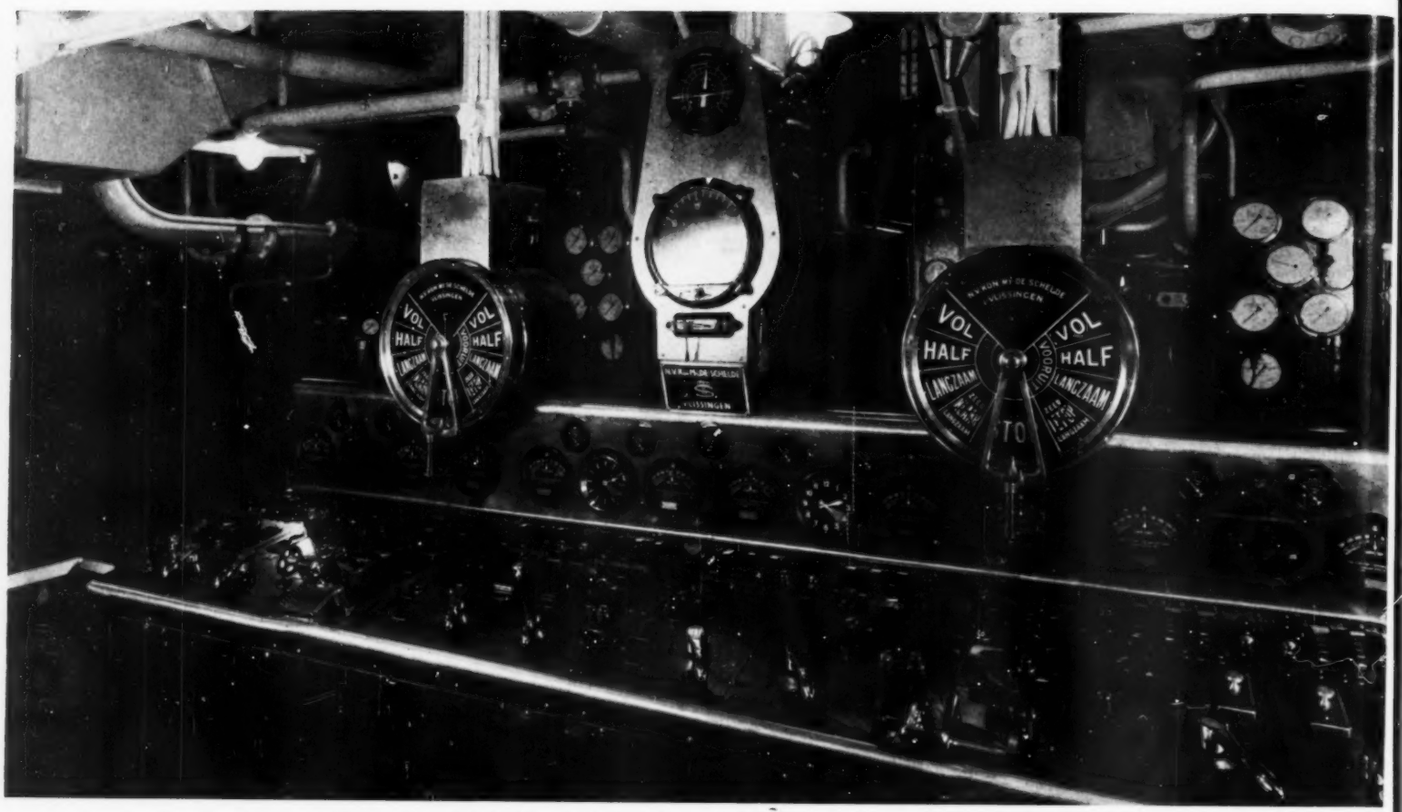
Though air starting is provided, as soon as one engine is running power can be transmitted through the slip couplings to start up any of the other engines connected to the propellor shaft.

Control System. The running and load on each of the eight engines is controlled from a centralized desk requiring only one attendant to carry



Outboard profile of the *Willem Ruys*, 21,300 ton Dutch liner which did 24.6 knots during recent trials.

View of luxurious First Class reception hall of the *Willem Ruys*. The vessel provides accommodations for 840 passengers.



View of main engine control desk. Here, eight propulsion engines are controlled in groups of four. Any engine may be cut out if desired.

out all operations. Instructions are transmitted from the bridge by two electric telegraphs for the port and starboard groups of four engines respectively. The 32 cylinders in each group operate as a single engine when control is being operated entirely through the slip-couplings and the load is equally shared between the engines that may be running. In addition there are levers mounted on the control desk for cutting in or out any individual engine at will and further levers are provided for operating the air starting system and for adjusting engine speed which is shown by revolution counters also mounted on the control desk. Operation of the slip-couplings is controlled electrically while an hydraulic system is employed for engine control.

Auxiliaries. For lighting and other services there are three 1,000 kw. generating sets driven by Stork two-cycle engines and one 550 kw. set driven by a Stork four-cycle engine and there is also a 600 kw. turbo-generator. Steam for the turbine is provided from an oil-fired water tube boiler and one of the exhaust gas boilers. The exhaust steam is used to supply the evaporators which are capable of producing 250 tons of fresh water per day.

Fuel Consumption. The normal service speed of 21 knots corresponds to a propellor speed of 125 rpm. according to preliminary tests and under these conditions it is estimated that fuel consumption would be 0.38 lb. per shp. hr. including the losses through the slip-coupling and reduction gears. At the reduced speed of 20 knots corresponding to 120 rpm. propellor revolutions it is considered that the consumption should fall to 0.37 lb per shp. hr.

Special Equipment. Anti-rolling tanks are incorporated in the hull design and it is considered that these will have a considerable stabilizing effect upon the ship when in rough seas. The pumps controlling the amount and rate at which liquid is transferred from port to starboard tank, and vice versa, are automatically controlled by an electrical device. Weather during the trials was not suitable for a full test to be carried out.

A radio-telephone station is installed together with the latest developments in radar.

An unusual feature is the provision of escalators from the kitchen on "D" deck to facilitate service to the dining saloons situated on "C" deck.

Accommodation. Counting the house top there are altogether 11 decks and passengers are carried over a total of six of these including the bridge deck, upper promenade deck, lower promenade deck, boat deck, and "A" and "B" decks. Cabin accommodation is provided for 840 passengers—first class 344, second class 301, third class 109 and fourth class 86.

The first and second class dining saloons, seating 162 and 332 respectively, adjoin and can be made into one large room by opening the sliding doors separating them. These saloons are on "C" deck as is also the third class saloon, seating 120 passengers, situated further aft.

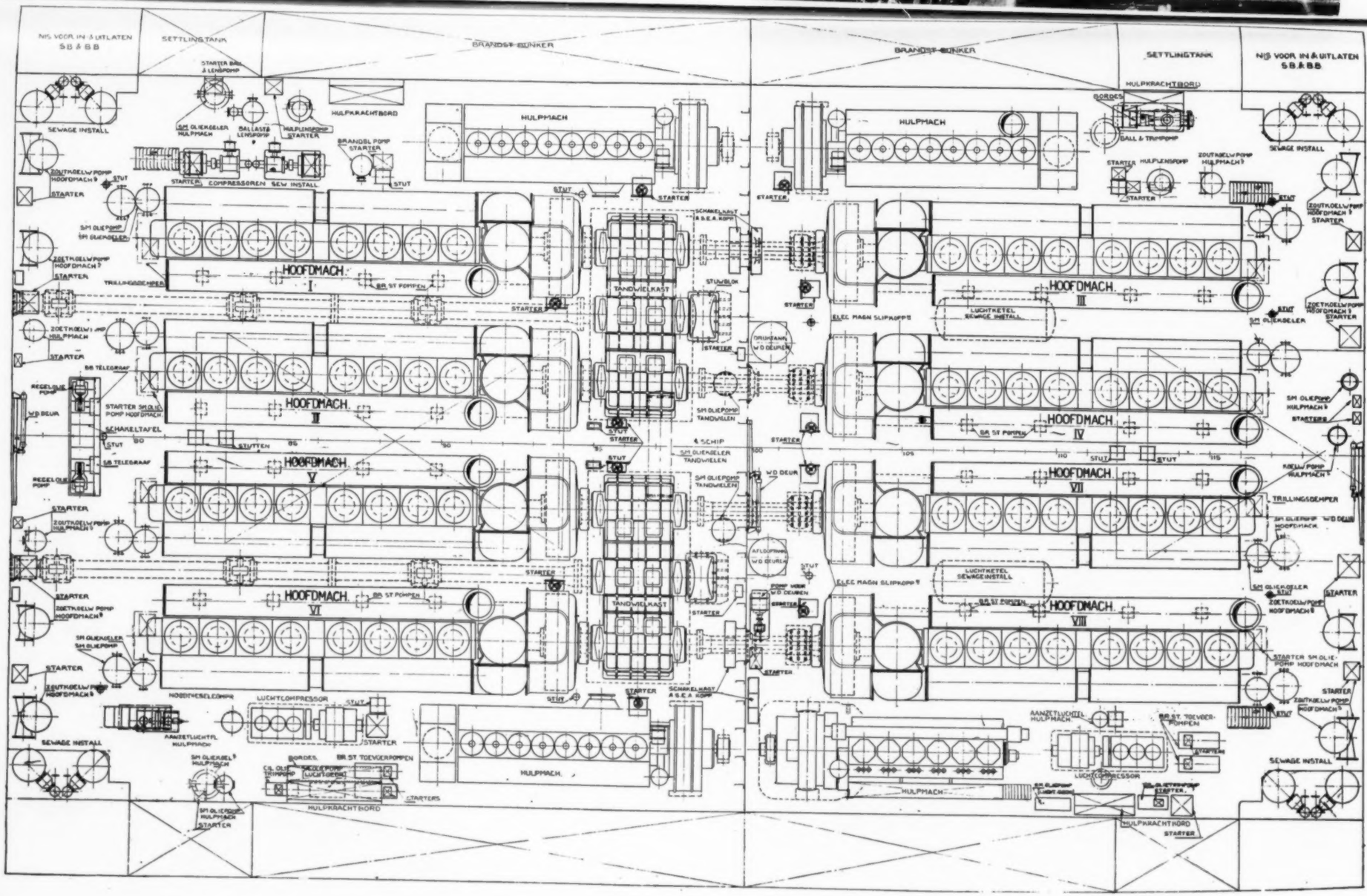
Spacious lounges are provided for each class and the first-class observation room, almost semi-circular in shape and with large windows facing forward, is unusually comfortable.

Sport decks and swimming pools are also provided for each class, the oval swimming pool for first class passengers being particularly attractive in design.

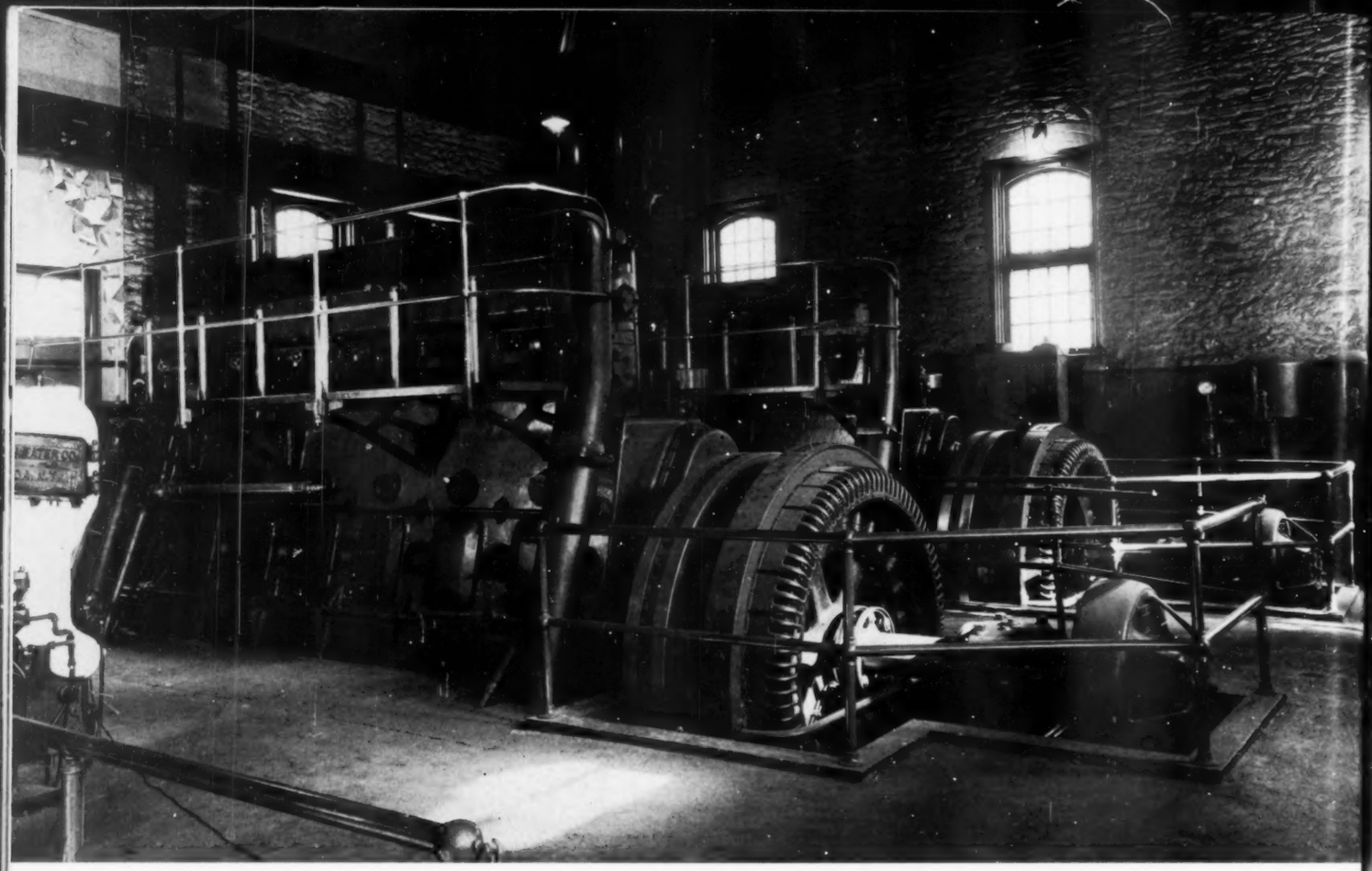
Accommodation for children has been made a special feature, their complete safety is ensured and the decorations and games provided must surely appeal to children of all ages.

Willem Ruys is now in regular service between Rotterdam, Southampton, Tangier, Gibraltar, Marseilles, Port Said, Suez, Colombo, Sabang, Belwan Deli, Singapore and Batavia, and one left her at the conclusion of the trials feeling that to make a voyage in her could not fail to be a happy and pleasant experience.

Rotterdam Lloyd was founded in 1883 and the *Willem Ruys* is the seventy-sixth vessel to be constructed for them at Flushing since that date. Following the successful completion of the speed trials it was announced that Queen Wilhelmina had graciously granted her patronage to the company so we now wish the "Royal Rotterdam Lloyd" every success in their latest endeavour.



Engine room layout showing eight 3,375 bhp. Sulzer engines. Engines are arranged in pairs each driving through a magnetic slip coupling to an intermediate shaft which in turn drives the propellers through a gear box arrangement. Three 1,000 kw. Diesel Generating sets and one 550 kw. set are seen port and starboard. Pumps are located along the forward and aft bulkheads.



Two De La Vergne 400 hp. Diesels and General Electric generators—for standby and peak loads in the Westchester Joint Water Works.

DIESELS . . . .
FORTY-FIVE MINUTES FROM BROADWAY

By BRUCE C. SISSON

The plant nestles in this rural setting though only 45 minutes from Broadway.

THE Westchester Joint Water Works was originally operated by private owners and supplied water to the householders of the adjacent area. Until 1928 steam power was used exclusively for the 20-odd years of the plant's operation, but at that time the owners decided to sell their interests and the combined funds raised by the town of Harrison and the town and village of Mamaroneck financed the purchase of the plant. To give the plant a suitably cooperative title the name, New York Interurban Water Company, was changed to The Westchester Joint Water Works. However, the old name is still emblazoned over the front entrance.

In 1928 it was decided to install Diesel generators to replace the old steam plant and on the day President Hoover was inaugurated the first Diesel, a 400 bhp. De LaVergne, started its career as a dependable power producer. The second Da LaVergne, a duplicate of the first, was in service shortly after. For the decade following until 1947, the Diesels carried the power load required, supplying water to the three municipalities.

The engines are both 6 cylinder, 4 cycle, solid injection Diesels. They drive 275 kva. General Electric generators at 400 volts AC.

The pumps, supplied from the engine room power bus, are driven by 150 hp. G-E motors at 1750 rpm. The pumps themselves are De Laval centrifugals with a capaicty of 3,000,000 gallons a day. There are three of these and they operate either singly or in pairs according to the load. These are the high lift pumps which pump the water through the mains. The low lift pumps handle the water from the time it enters the plant until the high lift pumps take over the distribution.

Beginning in 1937, the Westchester Light and Power Company began supplying power to the plant and the Diesels after 10 years of labor had a chance to rest. At present the Diesels are operating only three months of the year and then only between the hours of 3 and 7 P.M. This period stretches over the winter months from November through January. The Lighting Company welcomes this aid during that period of twilight when residential and industrial loads combine to tax its power output.

Owen Davies, Plant Manager, led us on an interesting tour through the plant explaining the workings of water purification. He explained how the raw water was taken from a neighboring lake, through strainers and pumped into a settling tank where powdered alum was agitated with the water. Then he showed us the filtering tank where the alum and its accumulated impurities are taken from the water. We were then shown the chlorination process in which approximately 50 lbs. of chlorine are discharged daily into the 3,000,000 gallons of water. Despite the 7 degree cold the water showed no signs of freezing, doubtless due to the constant agitation by the pumps.

Back in the warm engine room after this trip through the purification plant, we checked the auxiliary equipment for familiar names amid the imposing array of De LaVergne equipment. First noted was the Brown exhaust pyrometer mounted on the G-E switchboard. Then came the Viking fuel oil pumps and the auxiliary lube oil hand pump by Deming.

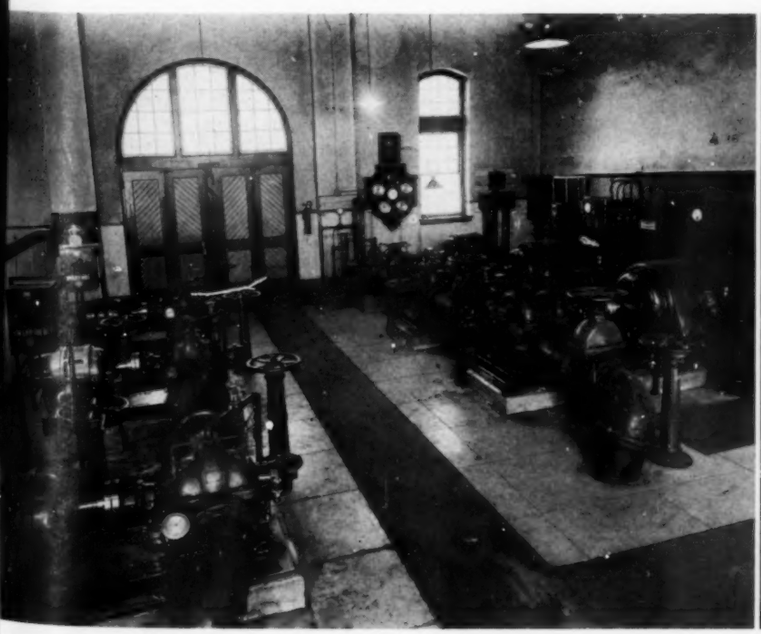
Mr. Davies' cooling water problem has been solved. He does not worry about heat exchanging problems. He has more cooling water than he knows what to do with. His lubricating oil, now that the Diesel operates only three months of the year, is equally simple. A single batch on a by pass filter arrangement carries him through the period. He uses Tide Water lubricating oil (paraffin base) and Atlantic No. 2 fuel oil.

As far as maintenance is concerned, Mr. Davies and Mr. Crisp, his assistant, both agreed it was more or less routine. In the nearly twenty years of operation one main bearing has been replaced on one engine. Periodic inspections of the engine have revealed only cleaning and new rings necessary. Cook piston rings served as replacements.

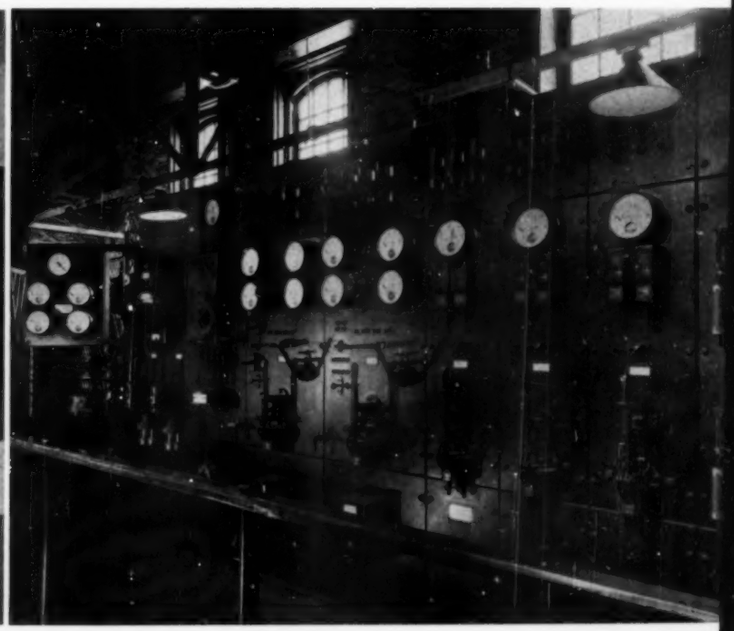
The Westchester Joint Water Works is a well organized municipal plant supplying pure water for three towns within 15 miles of the New York City limits but as seemingly remote as a self-sufficient little power plant in the midwest.

The two De LaVergne Diesels, though they are now in partial hibernation, are ready to give many thousands of horsepower hours.

Pumps are De Laval centrifugals driven by G-E motors—total capacity 3,000,000 gallons per day.

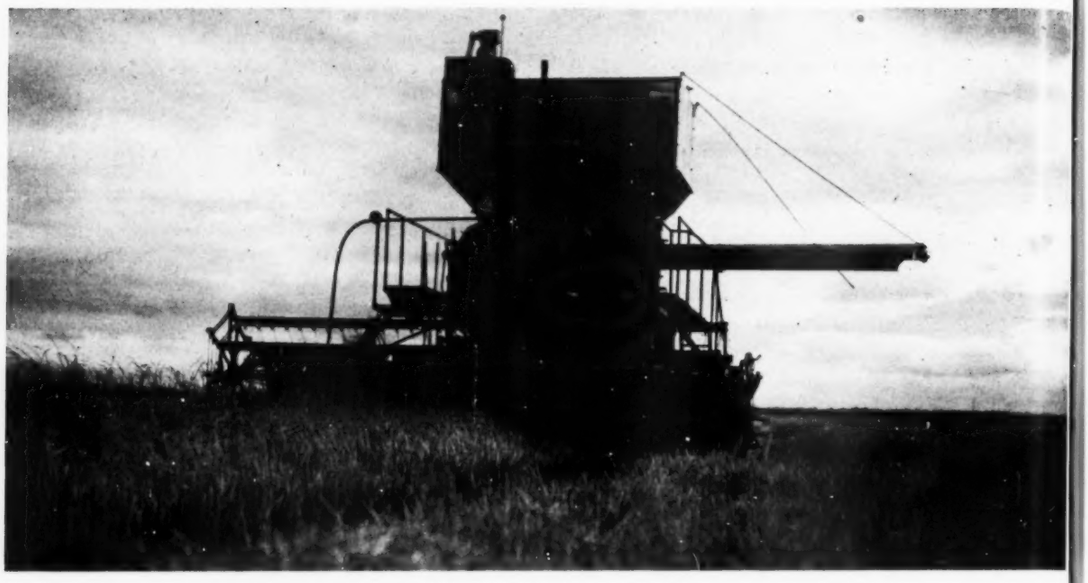


The switchboard is G-E and carries complete controls for engines, generators, pumps and lighting.



BIG DIESEL COMBINES

Harvest Record California Rice Crop



Rainy weather doesn't stop this self-propelled Diesel Combine operating in rice fields of Sacramento Valley.

By F. HAL HIGGINS

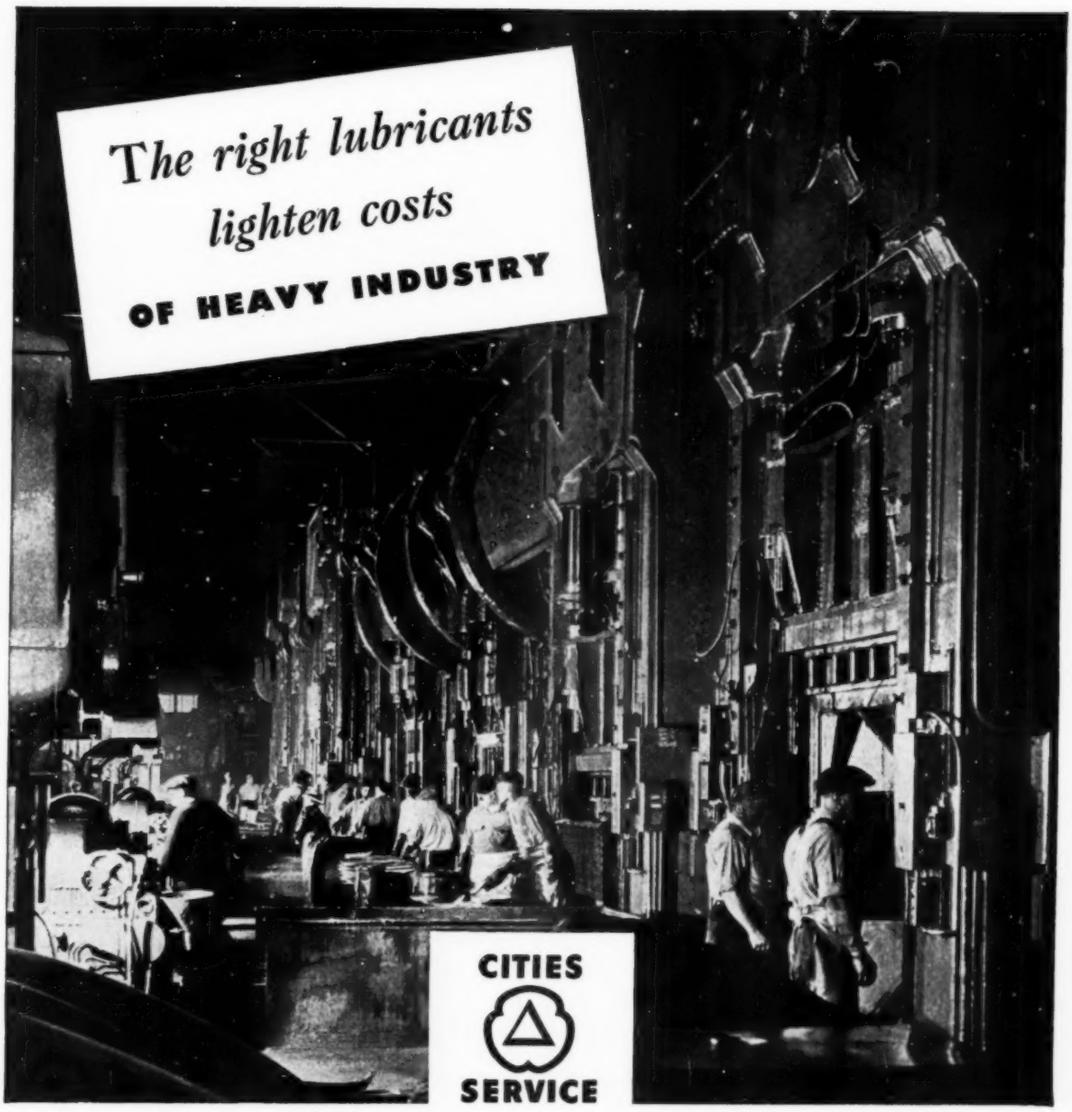
"THIS California rice crop is a result of perfection in mechanization!" So declared Prof. Roy Bainer, head of the Agricultural Engineering division, University of California, when the writer showed him the Dec. 23, 1947, official Rice Market Review of the State Department of Agriculture Market News Service. The rice trade had been figuring a yield of 60 to 65 bushels for this latest California rice crop until this final estimate jolted them with a 76-bushel yield. It meant that the 235,000 acres put into rice last year had yielded some $5,000,000 to $10,000,000 more than anticipated. And that kind of money "ain't hay" even with rice growers in this post-war bulge of prices!

So, knowing Bainer since his arrival in California from Kansas 18 years ago, the writer went in to ask him what the answers were. Bainer was not one to hold back comment, as rice had been his first problem when he waded into it upon his arrival from Kansas. Caterpillar men had noted Bainer and one or two others from Davis that fall of 1929 as they checked over the first combining of rice at the River farms and one or two other spots in the Sacramento valley where the combine was being tried out with windrow pick-up.

"I worked with combines on River Farms that fall of 1929," said Bainer. "Then Cerati, an Italian engineer, had brought in a drier from Italy, where his brother built them for the Po Valley rice crops. My studies went into a University-U.S.D.A. Bulletin, but the growers paid little attention to it for several years in that low spot in the rice picture that spelled depression. By 1935-36 some driers were built and direct combining got going to make a big cut in crop losses and better quality of crop for higher profits to growers. Well, today, California rice is so far out in front on the mechanization road that it is on its own as far as the University is concerned. I took my class of agricultural engineering students up the Valley into the Sutter Basin one wet day last October to watch the combines work. It was an eye-opener to me to watch those big Diesel-engined one-man combines go through on tracks where the pull combines were bogging down even with crawler tractors pulling them. We saw one self-propelled combine pull out a bogged pull machine as well as the D6 crawler that had gone down trying to pull it through that wet field. It was the wettest October in 50 years, you know. Yet, here in December the crop is all harvested this year and the highest quality and almost highest yield per acre in history. This harvest system of our California rice growers has given them quality control they never had in the old days of binder-thresher harvest. It's a great mechanized farming achievement. You are right in guessing this California rice grower is probably the most efficient food producer in the world today when the man labor efficiency is concerned. It's a matter of high managerial skill over skilled labor operating big Diesel tractors for all the ground work, and winged farming for seeding, fertilizing and cultivation."

Over 20 Dieselized One-Man Combines

The Heidrick-type Diesel-powered (GM) one-man bulk combines that came in two years ago with the first one built by Heidrick Brothers on their ranch near Woodland in 1945 have spread until there are at least 20 either copied or adapted from their blue prints. The Allis-Chalmers dealers at Sacramento, Stockton and Woodland furnished all the GM engines for those built by Heidrick, Kaiser, Hahn & Mehrten, Capital Machine Works, Tom Sills and Earl Wallace. One thing the writer found in checking over these machines in the wet October of last fall: every one was going through without bogging down and their owners were so sold on them over the older machines they were ordering more of them for the 1948 harvests. Practically all that were ready in time worked in both barley and rice harvests, starting in May or June for grain. They got all the rice crop instead of leaving low wet spots, field edges and odd-shaped corners and lands. Rice was worth saving and they saved it all where they would have left many patches in ordinary years for fear of getting stuck for a half day or so. Savings by the Diesel one-man bulk jobs run in 3 directions: men, rice, time. Skilled labor on these rice harvests has been getting $1.50 to $3 an hour. That latter is for combine operators who draw from $17 to $20 a day. It takes one man on a self-propelled bulk machine where it took 3 on a tractor-pull machine. Time becomes an important factor. The men with these machines and driers cut their season in half and escape the hazard of a wet November and December that used to cost 10% to 25% of the crop and lower the grade of the rest of it. Over half the farm drawbar horsepower is done by crawler tractors and a large portion are Diesels.



INCLUDED in the Cities Service products family of industrial lubricants are oils and greases for more than a thousand industrial applications. Whether your requirements demand a highly refined spindle oil or the heavy duty type greases used on these massive automotive body presses, you'll find it in the right grade and the right type among the industrial lubricants of the Cities Service Oil Company.

Determining the right type and grade of industrial lubricant frequently involves costly experimentation. Why not let a qualified Cities Service industrial lubrication engineer take over your lubrication worries. His recommendations may save invaluable production time and substantially cut operating and maintenance costs in your plant or transportation equipment.

Write Cities Service Oil Company, Sixty Wall Tower, Room 53, New York City 5, N. Y. This puts you under no obligation, of course.

CITIES SERVICE OIL COMPANY

NEW YORK • CHICAGO

In the South: ARKANSAS FUEL OIL COMPANY

Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

Fuel and Fuel Injection Equipment

THE efficiency of any Diesel unit, as we all know, is greatly affected by the condition of the fuel injection equipment, namely the fuel pumps, check valves, needle valves, atomizers, etc. Many engineers have expressed the opinion lately, that their units are not functioning as efficiently as they did during the war years, and blame this condition to various lauses. One of their chief complaints being the fuel condition.

To the writer, it does seem that many fuels are not up to the prewar or even the war year standards, and while I do not mean to insinuate that this is a general condition, still it is very apparent in some localities, that the higher the price of fuel, the poorer the quality. By that I mean, from our own experiences and analysis of our fuel, that we do not get the efficiency out of the present day fuel at 10 cents a gallon, that we got out of prewar fuel at 2½ cents a gallon, though it is supposed to be the same fuel from the same vendor.

The mechanical condition of our units is maintained at as high a level as it was in prewar days, but in order to do so we are forced to clean our fuel systems and fuel injection equipment oftener than we did in prewar or even during the war period days. And that brings us to the point of maintenance on fuel injection equipment.

Maintenance of fuel injection equipment is a matter of no little consequence in Diesel operation. And when the maintenance man starts in to overhaul his fuel injection equipment, he cannot expect results to be satisfactory without a lot of care and patience being devoted.

Whenever overhauling the fuel injection system, it is advisable to inspect all parts of that system.

Trouble may be in the pump itself, there being too much tolerance between the pump piston and the bushing or sleeve. Again the fuel check valves in the pump may be worn to a point where they do not hold. Often you will find that the needle valve is either worn at the point where the packing contacts the valve, or you will find that the point of the needle valve is badly scored, pitted and, in some instances, chipped off. The atomizer assembly may be plugged up, or the grooves in the cone, clogged, the atomizer seat or needle valve seat pitted.

No matter what condition exists, the fuel injection system must be in first class condition throughout to function perfectly. If your pump is in A No. 1 condition, your check valves holding, your atomizer seating well, but your needle valve binding or pitted, the effectiveness of the parts which are in good condition goes for naught due to the one defective item. Therefore in overhauling your fuel injection systems, it is always advisable to do the whole job, making all parts mechanically right, rather than do a good job on half of the equipment and allowing the balance of it to go "as is."

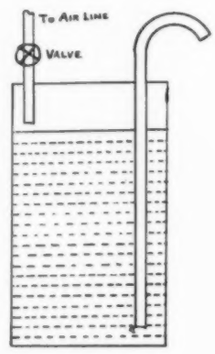
Proper seating of atomizers, maintaining a perfect condition on your flame plate, so that the flame plate hole is not partially covered or clogged by burnt carbon is very important. The condition of the atomizer holes is of vital importance on both air and solid injection units, but more so on the solid injection where fuel is injected at a much higher pressure through smaller openings.

When one examines the fuel nozzle on one of the large solid injection units and finds that the fuel is supplied through very small holes, about .010 to .012 in. in diameter at 4000 lbs. pressure, he can readily realize that his fuel should be as clean and free from foreign matter as it is humanly possible to obtain.

Therefore when one runs into fuel which is not of a desirable grade, and has to depend on centrifuging and numerous filters to remove the foreign material, he will undoubtedly run up against the problem of maintenance much oftener than he will with a good clean fuel. Since it is almost impossible to remove all this foreign material, no matter how much centrifuging and filtering is done. If you don't have a good clean fuel to start with, your problems are multiplied.

The maintenance department in every plant should be equipped with the proper equipment, such as reamers, for both atomizer seats and fuel nozzle seats in the air injection type, test equipment for testing the nozzles on solid injection type, proper lapping compounds and either green or red rouge for finishing when lapping in. Then take great care when lapping in to see that the proper seat is obtained, not too wide nor too narrow and that the proper fit and tolerances are maintained between the plungers and barrels of the fuel pump and the needle valves and their respective casings. Inspect your fuel injection equipment often and if you keep it in first class condition, you will insure greater efficiency in operation.

Method for Pumping Barrels



M. L. Monson of the Fosston Municipal Light and Power Plant sends in an interesting method for removing fluid such as oil from a drum.

An air line is connected to the top of the barrel, an air valve in the line is desirable to control the flow. Then another pipe is lowered into the barrel almost to the bottom and the joint at the top sealed.

Then by using compressed air the oil may be forced out of the barrel in any quantity desired without spilling any.

A Climax to Years of Development

BALDWIN
SERIES 600
Diesel Engines

5-6-7 or 8 cylinders

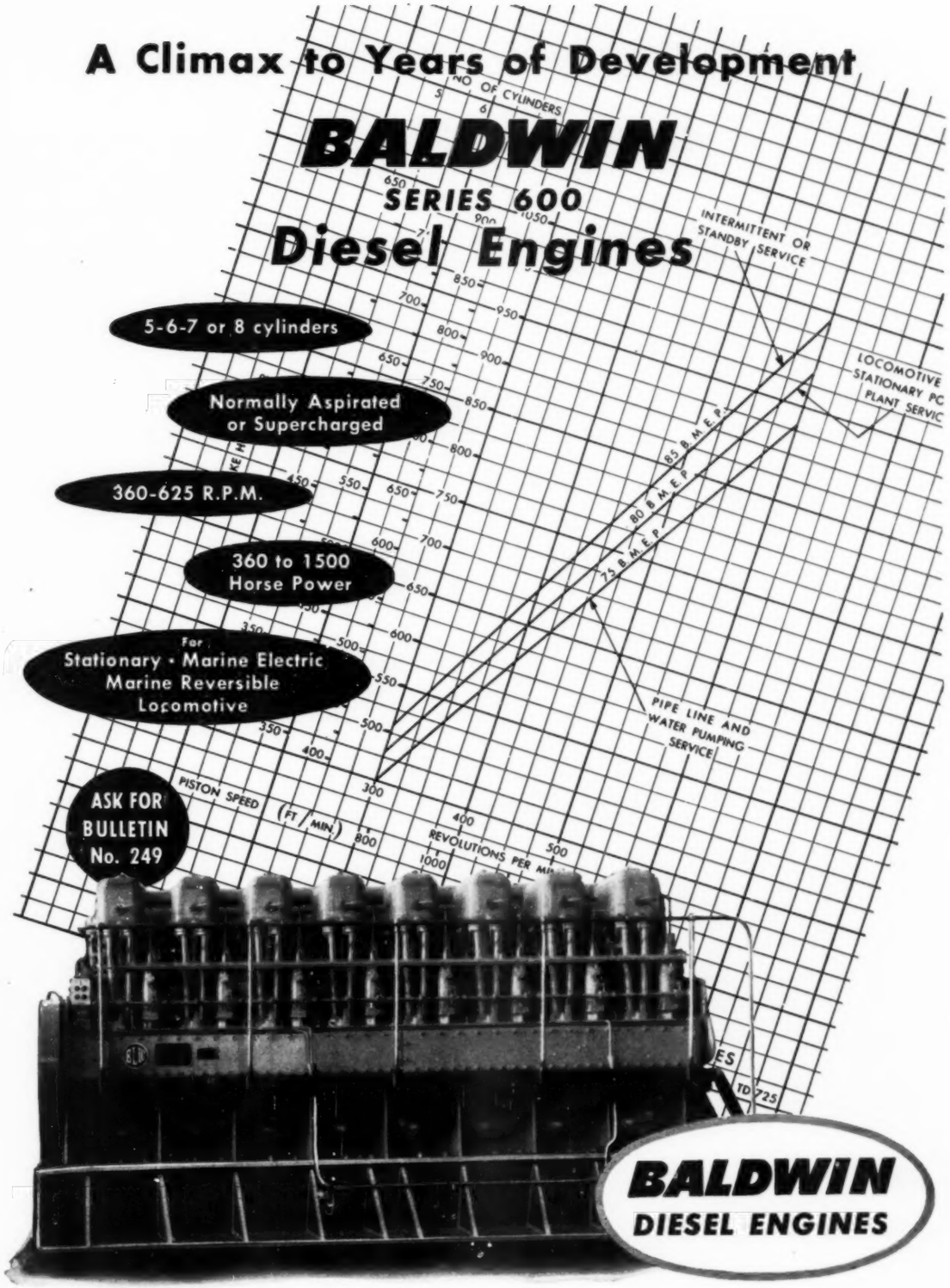
Normally Aspirated or Supercharged

360-625 R.P.M.

360 to 1500 Horse Power

For Stationary • Marine Electric Marine Reversible Locomotive

ASK FOR BULLETIN No. 249

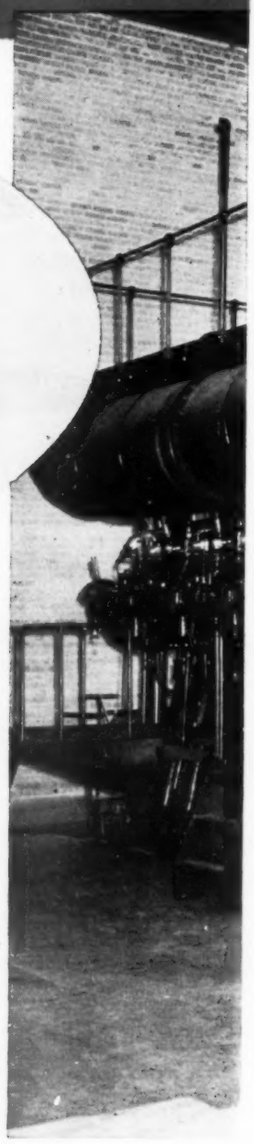


BALDWIN
DIESEL ENGINES

THE BALDWIN LOCOMOTIVE WORKS—*Paschall Post Office, Philadelphia 42, Pa.*

Peace of Mind.

SINCLAIR GASCON OIL



Operating and maintenance headaches make life tough for engineers . . . make operators wish they had a friend. That's where GASCON OIL comes in. It *makes life easier* for the Diesel engineer.

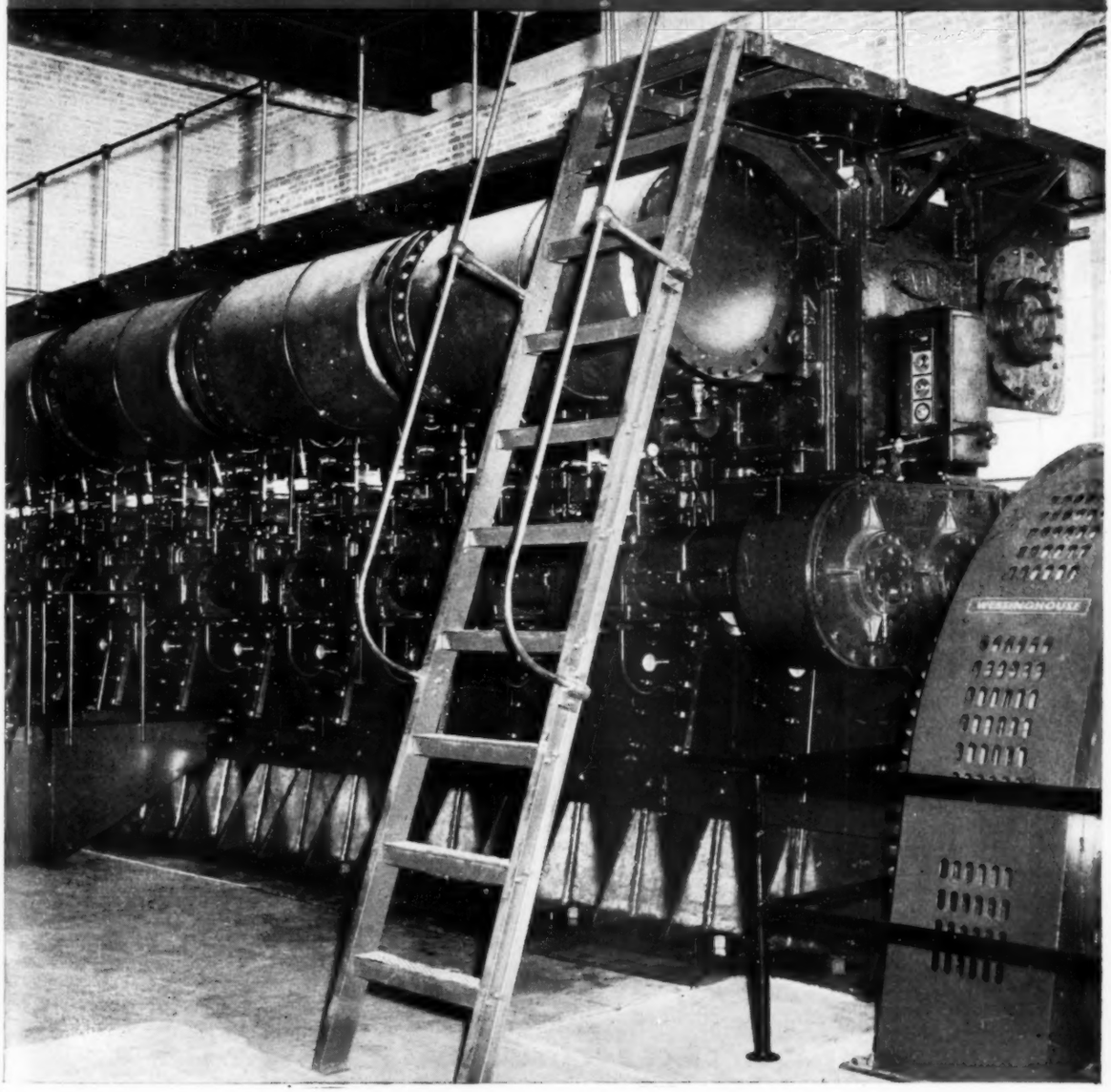
Inherent qualities in the basic crude give GASCON *natural ability* to clean engines and keep them clean . . . to wash away and disperse carbon and crankcase accumulations.

The effect of these qualities on Diesel operation gives engines longer time between tear-down . . . more continuous operation time . . . lower maintenance cost . . . more efficient operation.

Let us discuss GASCON OIL with you in relation to your operating requirements.

SINCLAIR

: for Diesel Engineers



INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N.Y.

Diesel Engine Smoke Symposium

. . . *Continued from page 42* . . . .

of spray-forms is available and, when an engine has shown its preference for a particular pattern, the slightest dimensional discrepancy or other departure from the standard may show up as smoke in the exhaust.

4. Droplet-size requirements are not well understood and there is a wide open field for research on the subject. There is evidence that some, if not most, of the highly turbulent engines prefer small droplet sizes; some seem to thrive on uniformly small droplets while others like at least two grades of size, in order to arrive at two different degrees of penetration; the compound spray produced by the throttling-pintle type of nozzle is an example of this.

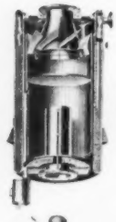
   In the case of the hole-type nozzles it seems that a thoroughly-mixed assortment of sizes is desirable. One thing is certain, and that is that the open-chamber type engine will not tolerate a fine, soft, fog-like spray. There is evidence that, in open-chamber type engines, the most satisfactory combustion is obtained from a spray consisting of a mixture of droplet sizes ranging from "buckshot" to "cannon balls," having a graded range of penetration through the air charge and variable times of evaporation.
5. In many cases of exhaust smoke the cause is to be found in improper timing of the beginning of injection; improper, that is to say, for the particular combination of speed and load at which smoke occurs. Also, under certain conditions, the timing may vary from cycle to cycle, causing intermittent puffy smoke. "Cyling" of the injection is more likely to take place at light loads, particularly in engines demanding a very wide range of fuel quantity per pump-stroke from idle to full load.
6. Almost all Diesels seem to prefer a high initial rate of injection. Some types indicate this preference by tolerating considerably more latitude in injection timing when the initial rate is high, being excessively sensitive to timing if the initial rate is low, but withstanding appreciable variation of timing (for a given operating condition) if the initial rate is high.

   Sometimes pilot injection has been found to promote smooth combustion; in some executions the pilot charge issues from a nozzle separate from, and located at some distance from, the nozzle for the main injection; in other executions the pilot charge is intended to issue, as a pre-injection, from the main nozzle, there being no separate pilot nozzle. With the former execution it may be that the burning of the pilot charge creates turbulence in what might otherwise be an excessively quiescent combustion chamber, thereby reducing the ignition lag. It is known that, in some European systems aiming to secure pre-injection of the pilot charge from the nozzle employed for the main charge—and which do in fact give excellent engine performance—the pilot charge does not actually appear as a separate pre-injection at all; however, the *attempt* to cause a pre-injection is effective in producing a very high initial rate of injection of the main charge, which proceeds without interruption from beginning to end; this high initial rate is probably due to the building up of pressure in the injection tubing, from "residual line pressure" to a value just below the "opening pressure" of the nozzle, immediately before the beginning of injection of the main charge.
7. Excessive duration of injection is probably the most common of all causes of exhaust smoke. Even though the main spray may be of conservative duration, secondary injections may stretch the overall duration to an intolerable value. Very careful selection of the correct combination of variables is necessary in order to achieve short crisp injections with high initial rate of discharge minimum fluctuations of rate, and quick cut-off without secondaries or dribble. Commercially successful engines vary in their duration requirements from around twenty up to forty degrees of crankshaft rotation.

EXHAUST AND INTAKE SILENCERS

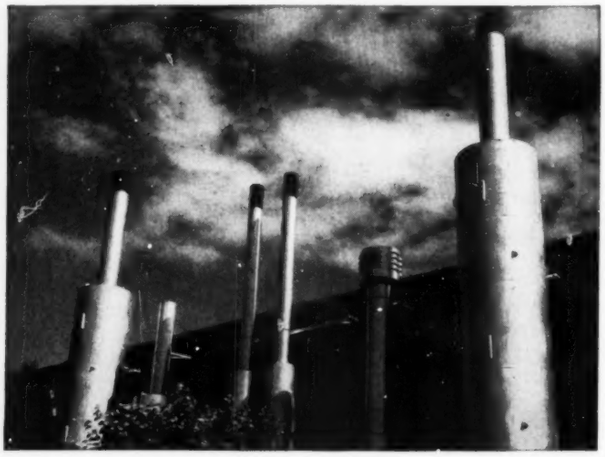
SPARK ARRESTOR SILENCERS

STEAM BLOW-OFF SILENCERS



HEAT RECOVERY SILENCERS

AIR-JET SILENCERS



FOR MORE EFFICIENT SILENCING
. . . BE SURE IT'S A MAXIM

Over the years Maxim has had the practical experience and research facilities to develop and build the finest silencing equipment available. Throughout industry Maxim Silencers have become a standard for many silencing jobs: on internal combustion engine exhaust and intake — compressor intake — vacuum pump discharge and steam blow-off. Maxim Heat Recovery Silencers recover waste exhaust heat to produce steam or hot water and afford the opportunity for a highly efficient hook-up. Maxim Spark Arrestor Silencers provide 100% positive spark arresting and are invaluable where a fire or dirt nuisance hazard exists.

Maxim offers a wide choice of standard silencers to fit the requirements of nearly any installation. The Maxim engineering department is always available to you for consultation and consideration of special silencing problems.

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MAXIM SILENCERS

BULLETINS AVAILABLE
Please specify type of silencing equipment of interest to you.

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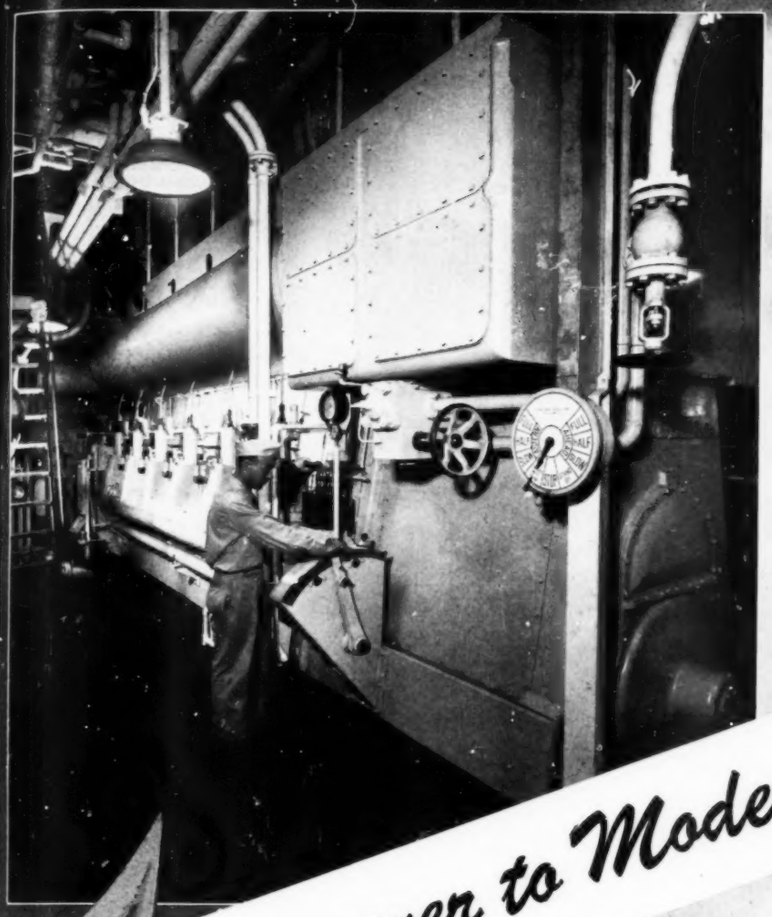


NORDBERG DIESEL POWER

The Answer to Modern Ship Propulsion

• Modern motor vessels propelled with dependable, economical Nordberg Diesel engines are becoming increasingly in evidence in coastal service. Motorship Square Knot of the Alaska Steamship Company is one of about twenty sister ships running in the general Alaska trade from Seattle to the Aleutians. Propelled by 1800 horsepower Nordberg Diesels, these ships have proved unusually satisfactory and profitable to operate.

NORDBERG MFG. CO., MILWAUKEE 7, WIS.

Whatever your propelling needs, whether an engine of 165 horsepower or one of 8500 horsepower, there is a Nordberg Diesel that will give the performance that meets today's shipping demands.

BUSCH-SULZER
A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES

NORDBERG MACHINERY

Diesel Industry Used 40 Million Lbs. of Aluminum in 1947

THE following quotation from an Aluminum Company of America market report illustrates the widespread use of aluminum in the Diesel industry today:

"The war stimulated the development of light-weight, high-speed, compact Diesel engines, which are finding increasing applications in the railroad, marine, truck and bus fields. The trend in this field is to use more and more aluminum in order to reduce the weight-per-horsepower ratio, and thereby open up new fields which have formerly been closed to these engines because of their bulk and high specific weight. More aluminum was used in 1947 for such Diesel applications as cylinder heads, pistons, cylinder blocks, crankcases, gear covers, flywheel housings, superchargers, connecting rods, crankpin boxes, frames, bearings, and a great many smaller parts.

"The Diesel engine industry is rapidly increasing the number of engines built each year. It has been reported that U. S. Diesel factories will turn out 12,500,000 Diesel horsepower in 1947 compared with 10,000,000 horsepower last year and 2,500,000 horsepower in 1939, the best pre-war year. It is estimated that Diesel engines built in 1947 have used approximately 3-3½ pounds of aluminum per horsepower. With the increase in the number of engines being built and an increase in the number of lightweight parts used, it is expected that the tonnage of aluminum employed by the Diesel industry during 1948 will be greatly increased."

ENGINEERING SOCIETIES MEETINGS SCHEDULED

S.A.E. National Meetings

Summer Meeting	French Lick Springs Hotel	French Lick, Indiana	June 6-11
National West Coast Meeting	St. Francis Hotel	San Francisco, Cal.	August 18-20
National Tractor and Diesel Engine Meeting	Hotel Schroeder	Milwaukee, Wisconsin	Sept. 7-9
1949 Annual Meeting	Hotel Book-Cadillac	Detroit, Michigan	Jan. 10-14, 1949

You get . . . . . MORE for your POWER DOLLAR
with
BUCKEYE DIESELS
CYLINDER HEAD DESIGN
Unique Buckeye design eliminates valve cages and provides larger valve areas. Unrestricted air flow and quicker expulsion of gases increases combustion efficiency. Heads removable without disturbing exhaust or air intake manifolds.
PISTONS
Nickel chromium, heat-resisting alloy iron of very fine texture and exceptional hardness. Mirror finished. Crown designed to prevent heat transfer to piston pin.
BEARINGS
Reversible, shell-type, silver alloy. Manufactured by exclusive Buckeye process. With proper care will last life of engine.
CRANKSHAFT
Solid forging of open hearth steel. Special chemical properties counteract fatigue and crystallization. Extra heavy construction eliminates torsional vibration and critical speeds.
CYLINDER LINERS
Made of close-grained, extra hard nickel chromium alloy, mirror finished. Water-cooled over entire surface. These features more than double liner life.
SILENT WATCHMAN
Cuts off fuel supply at nozzles—immediately stopping engine—if either oil or water supply drops below pressure necessary to serve engine. Exclusive Buckeye feature.
CAMSHAFT
High carbon steel. Hardened valve and injection cams. Fuel injection cams adjustable by degrees.
CONNECTING RODS
Drop forged from single billet of special high carbon, open hearth alloy steel. Precision balanced—rifle drilled. Buckeye method of bearing cap mounting assures positive alignment and rigidity.
150-1440 H.P.
100-1000 KW
Every feature of Buckeye design and construction has been developed to bring the highest standards of dependability and economy to users of Diesel power.
Write today for your Buckeye catalog. Our engineering staff is always at your service. No obligation.
MARINE
STATIONARY
"Be Profit-Wise and-Dieselize with Buckeyes"
THE BUCKEYE MACHINE CO.
LIMA . . . . . OHIO
Engine Builders Since 1908

McColl Cites Bright Future for Diesel Locomotives

IN a recent forecast to all employees, R. B. McColl, President of the American Locomotive Company, predicted great strides in the production of Diesel-electric locomotives by the company. He stated in part:

"As you know, Alco is now doing almost 40% of the Diesel-electric locomotive business in this country. We are close behind Electro-Motive which had a head start in the road locomotive field and was helped by the war. We are way ahead of all other competition. We can maintain this position only if we are efficient, economical and a low-cost producer.

"There is a big market to be won. There are approximately 35,000 steam locomotives on American railroads today. It is estimated that it will take about 20,000 Diesel-electrics to replace them. The greater efficiency and lower costs achieved when railroads Dieselize make it almost certain now that a long-term process of Dieselization has started. At present production rates, replacement alone would require 10 years of production. The locomotive industry is not in a post-war boom—it is taking part in a railroad revolution. We have shifted our locomotive production from predominantly steam to predominantly Diesel. In 1947 the ratio was 85% Diesels to 15% steam locomotives shipped.

Bearing Manufacture Consolidated

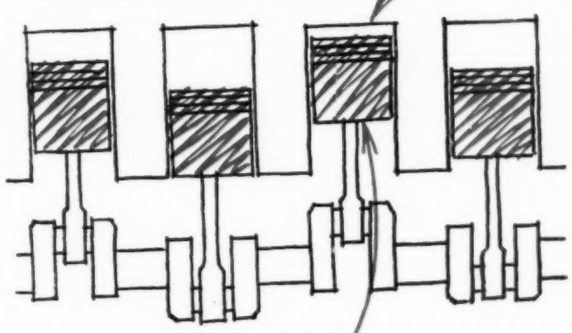
TO handle its growing business with the Diesel, aircraft, marine and machinery industries, The Cleveland Graphite Bronze Company has grouped its manufacturing operations in heavy-duty types of engine bearings into a separate unit, William G. Laffer, works manager, announced.

LUBE MEMO

Engine overheating caused by stuck rings

Compression loss 30%

400 400 280 400



Hot blowby gases burned piston.

Shop found rings in #2 badly stuck by ordinary oil (blowby has been wasting power).

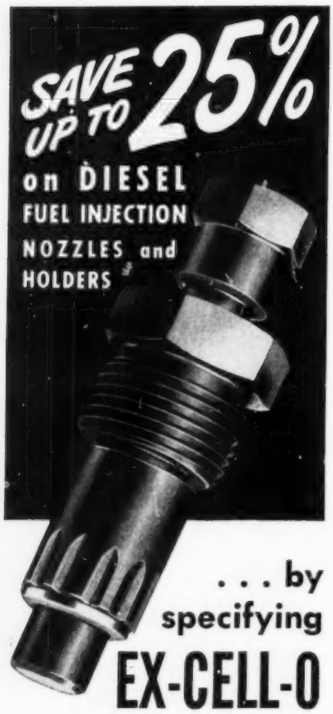
Foreman claims RPM DELO Diesel Engine Lubricating Oil's compounds will prevent stuck rings 3 ways:

1. Decrease carbon
2. Stop formation of gum.
3. Hold contaminants in suspension (they're flushed out on oil change).

Give shop go ahead on RPM DELO Oil

DIESEL ENGINE RPM DELO LUBRICATING OIL

STANDARD OF CALIFORNIA • San Francisco, Calif.
THE CALIFORNIA COMPANY • Denver, Colo.
THE CALIFORNIA OIL COMPANY • New York
STANDARD OF TEXAS • El Paso, Texas



. . . by specifying

EX-CELL-O

It's true. You can cut engine costs and eliminate field service problems. . . . simply by specifying EX-CELL-O Diesel Fuel Injection Nozzles and Holders. They are outwardly opening, differential type pintle nozzles designed to give you maximum efficiency from high speed Diesel engines of 5 to 300 H.P. Installation? Simple. No drain lines required, no adjustments necessary. Each unit self-contained, factory calibrated and sealed. Cost? *Approximately 25% less than any other nozzle on the market!*

Replaceable Nozzle Tip
Cross-sectional view shows simplicity of design. Only 3 working parts.

Write today for this booklet containing complete information.

Fuel Injection Division
EX-CELL-O CORPORATION
1200 Oakman Blvd. · Detroit 6, Mich.

New! **EX-CELL-O MODEL "S" SINGLE CYLINDER FUEL INJECTION PUMP FOR SMALL HIGH SPEED DIESEL ENGINES OF 5 TO 10 H.P.**

Write for complete details!

NAMES IN THE NEWS

ANNOUNCEMENT of the appointment of W. K. Cox, Assistant General Sales Manager, as Advertising Manager of Caterpillar Tractor Co. was made recently by Gail E. Spain, Vice President, coincident with the announcement of the retirement of Gerald M. Walker, who has headed the department since 1931.

J. J. Valentine W. K. Cox

Cox became associated with "Caterpillar" at its San Leandro plant in 1928. He has served in sales and advertising capacities. In 1943 he returned to the General Sales Department as Eastern Division Sales Manager and in 1944 was named Assistant General Sales Manager.

The retirement of Walker as Advertising Manager terminates 33 years' association with "Caterpillar" and one of its predecessor companies, The Holt Manufacturing Company, whom he had joined as a member of the advertising staff in November, 1914, at Stockton, California. Under his leadership, "Caterpillar" advertising has steadily progressed, and on frequent occasions has won national recognition of the advertising profession.

Succeeding Cox as Assistant General Sales Manager is J. J. Valentine, Central Division Sales Manager, who has been associated with the company since 1929. He has served in General Sales, Purchasing, Treasury and Export Sales Departments since that time and was stationed in the company's Washington, D. C., office several years.

THE MIDWEST DIVISION of Kelite Products, Inc., has opened new sales offices in Columbus with J. F. Riley as Manager, and in Cincinnati with J. T. Nolan as Manager.

A NEW SALES office supervised by J. E. Corbett at 2126 Monroe Ave., Rochester 10, New York, was recently opened by Penn Electric Switch Co. In making the announcement, R. H. Luscombe, sales manager, stated that the Rochester office is a division of the company's New York branch which is managed by N. E. Jennison.

WHEELCO INSTRUMENTS COMPANY announce the appointment of J. P. Cantor as District Manager of the new Cleveland District office located at 4501 Prospect Ave. Herbert Proske has recently been promoted to the position of Assistant District Manager of the Wheelco New York office. The Wheelco Washington, D. C., office has been moved to quarters at 2285 Rhode Island Ave.

W. C. DUNN, president of the Ohio Crankshaft Co., Cleveland, Ohio, announced recently the appointment of Maurice J. Hoke to the post of Works Manager of its crankshaft and camshaft divisions. Mr. Hoke came to Ohio Crankshaft in 1945 to work on special assignment in the company's new products division and in 1946 was named Chief Engineer. Mr. Dunn also announced the promotion of Alfred H. Scott to the position of Master Mechanic.

THE NAME of the Standard Oil Company of New Jersey has been changed to the Esso Standard Oil Company, it was announced recently by M. J. Rathbone, president of the company. The change was made to give formal recognition to the close association which has developed in the public's mind over a period of years between the corporate name and its Esso trademark.

QUINCY COMPRESSOR Company recently announced the appointment of two new sales representatives.

R. G. Morey Roy Nesbitt

R. G. Morey, Philadelphia, has been appointed to represent the company in upper New York State, all of Pennsylvania, Maryland, Virginia and the District of Columbia.

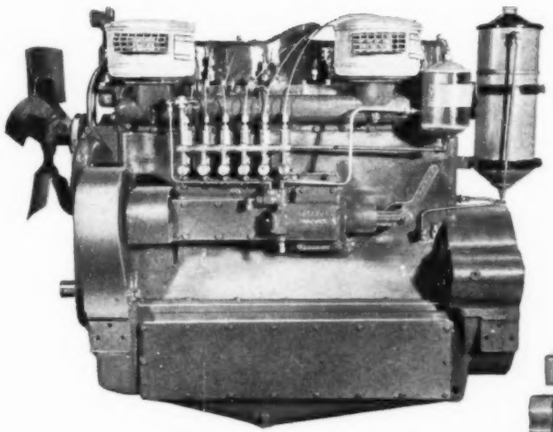
The other appointment was that of Roy Nesbitt, Atlanta, Georgia. He will be in charge of sales of the company's line of air compressors in Georgia, North Carolina, South Carolina and Florida.

BERNARD LESTER, Assistant Manager, Headquarters, Industrial Sales Department, Westinghouse Electric Corporation, has retired after 43 years of service with Westinghouse. Following his retirement January 31, Mr. Lester opened his own consultation service in the sale and distribution of machinery and equipment for managers of medium-sized and small industrial equipment builders and suppliers. His service will emphasize distribution and sales.

Which of These

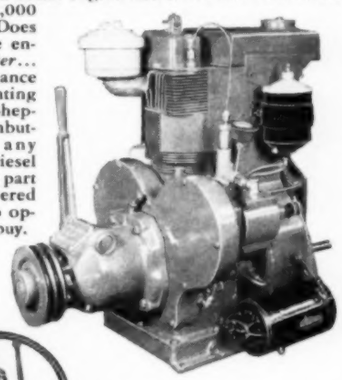
Sheppard Diesels

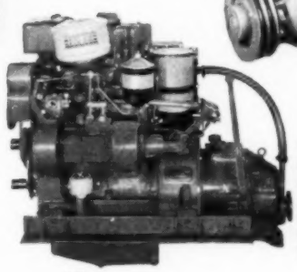
Can Solve Your Engine Problems?



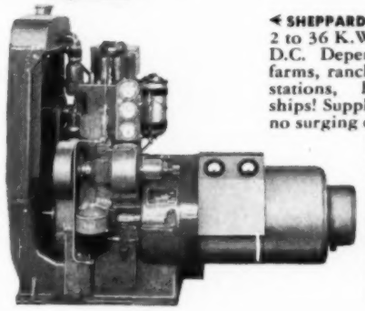
SHEPPARD POWER UNITS, 3.5 to 100 H.P. Thrifty, dependable Diesel power to drive compressors, pumps, shovels, mills, conveyors, saws: power-driven, portable, stationary and self-propelled equipment. Proved in thousands of war and peacetime installations, ashore and afloat, during the past 10 years. Fuel costs half that of gasoline, fuel consumption about half that of equal H.P. gasoline engine. Pushbutton or automatic starting in any weather, on safe Diesel fuel; easily operated. Exclusive Sheppard injector, only one moving part, insures smokeless, carbon-free combustion. Interchangeable parts on all models. Long Diesel operating life; thousands of hours without overhauls. Delivered complete, ready to work, no extras to buy.

AMAZING SMALL AIR-COOLED DIESEL (Sheppard Model 14, right). At last—dependable *Diesel* power for original equipment manufacturers, plant operators, farmers, contractors, lumber mills, other small engine users! 5.4 H.P. Available as power unit or 2,000 watt generator. Does any job a gasoline engine will do...*better*... with less maintenance ... at lower operating cost. Standard Sheppard features: pushbutton starting in any weather, on safe Diesel fuel; only 1 moving part in injector; delivered complete, ready to operate, no extras to buy.





◄MARINE PROPULSION ENGINES AND AUXILIARIES, 3.5 to 100 H.P. Available with reverse gear, with or without 2:1, 3:1 or 4:1 reduction gears. Auxiliaries come complete with fire and bilge pump, compressor, generator.

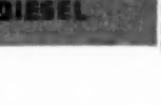


◄SHEPPARD GENERATING SETS, 2 to 36 K.W., 60 cycle A.C. or D.C. Dependable power for farms, ranches, camps, service stations, hatcheries, boats, ships! Supply constant voltage, no surging or drooping. Available with exclusive Sheppard LOAD-CONTROL . . . automatic starting and stopping of generator by load demand on A. C. power circuit. Delivered complete, ready to work.

DEALERS: Complete your line of engines and equipment with Sheppard—the *small* engine that opens a great new market for Diesels! A few dealer territories are still open. Send coupon for Sheppard Diesel franchise plan. No obligation. Mail the coupon today!

Mail this **FREE BOOKLET COUPON** *Today*

Get facts on how Sheppard Diesels can do your small power jobs at amazing savings in fuel cost, upkeep—and do the jobs *better* due to long life, dependable operation. Mail coupon now for free illustrated data sheets, facts, specifications, figures. No obligation!



DIESEL'S THE POWER *Sheppard's* THE DIESEL

R. H. SHEPPARD CO., INC., 503 Philadelphia Street, Hanover, Pa.

Send me further information on Sheppard Diesels. I am interested in (check):

( ) Dealer Franchise ( ) Original Equipment ( ) Air-cooled Engines
( ) Power Units ( ) Generating Sets ( ) Marine Engines

Name .....

Address .....

City ..... State .....

GENERATORS AC and DC

Well-known for their rugged design, efficient performance, long life and minimum maintenance, whether powered by electric, gasoline, or Diesel equipment. Backed by over ½ century of manufacturing and designing experience, Kurz and Root generators are now serving industries throughout the world

DC generator (left) two - bearings, self excited type Can also be furnished with direct connected exciter. Both AC and DC generators can be furnished in the single bearing, flange-mounted type for special mounting requirements. Ball bearing construction is used throughout. Complete data upon request.

Illustrated are AC generators, only 2 of the many different types developed and designed to fit specific needs and applications, (upper left) two-bearing self-excited type; (lower right) two-bearing direct connected exciter type.

AC-DC GENERATORS

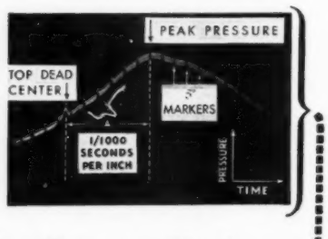
KURZ and ROOT Company Since 1898

APPLETON - WISCONSIN

.....and DC motors and motor generator sets

Have you ever seen the INSIDE of an EXPLOSION?

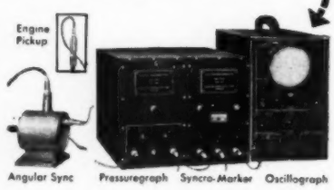
OR THE RATE OF ENGINE FLAME PROPAGATION



Seeing now made possible by remarkable new electronic features, embodied in

PRESSUREGRAPH with Syncro-Marker

Reproduces on oscillograph screen, accurate picture of pressures during and after explosion, relates pressure variation to time, top dead center, angular velocity, etc. Also accurate tracing of rate of flame propagation with relation to top dead center and peak pressure. See pressure-time characteristics of automotive, jet and Diesel engines, also compressors, pump, etc. Operates over range from static up to 10,000 cycles at pressures from 0 to 10,000 lbs.



Send for description and full engineering data

ELECTRO PRODUCTS LABORATORIES

549 W. Randolph St., Chicago 6, Ill. Phone STate 7444

GENERAL CONTROLS CO. recently announced the appointment of E. B. Maire as Sales Manager of the Midwestern, Southern and Eastern Branch offices. As Sales Manager, Ed Maire will assist and coordinate the efforts of the above branch offices in the contact with original equipment manufacturers, wholesalers, and utilities in the sale of automatic temperature, pressure and flow controls.

ELECTRIC AUTO-LITE Company has announced the appointment of J. H. Lambrix as Assistant Director of Purchases. Mr. Lambrix has been with Auto-Lite for 23 years joining the Engineering Department of the Battery Division in 1925 at Niagara Falls, N. Y. He joined the purchasing department four years later.

S. H. COLLOM, JR., Executive Vice President of the Pennsylvania Flexible Metallic Tubing Company, Philadelphia, announced the appointment of William Townsend as General Sales Manager.

Mr. Townsend assumes his new responsibilities with a wide engineering background and sales experience pertaining to flexible metal tubing applications.

Also the appointment of Edward Sala as manager of the mid-west branch of the company was announced.

V. C. GENN, General Sales Manager of the Detroit Diesel Engine Division, General Motors Corporation, has announced the appointment of J. G. (Jack) Deakins as industrial sales engineer for the State of Michigan.

TWO CHANGES in the executive staff of the Bear Manufacturing Company to keep pace with the rapid expansion of the firm in recent years have been announced recently by Will Dammann. Edward Quekels has been named director of a newly created product development and service department. Walter V. Hall will take over sales of Automotive Alinement and Industrial Balancing equipment.

MACK TRUCK Vice-President, A. C. Fetzer, recently announced the following appointments: C. E. Cole has been made District Manager in charge of the Los Angeles Branch. Lawrence D. McLean has been appointed District Manager in charge of the Reading, (Pa.) Branch. T. H. Jones has become District Manager in charge of the Charlotte, (N. C.) Branch. William Dudde has been named District Manager in charge of the Bronx, (N. Y.) Branch.

BROWN INSTRUMENT Company has opened a new district office at 922 Dermon Building, Third

nd Court streets, Memphis, Tenn., it was announced last month by W. H. Steinkamp, field sales manager for the industrial division of Minneapolis-Honeywell Regulator Company.

ANNOUNCEMENT OF THE appointment of Mark A. Clements as general Service Manager of Caterpillar Tractor Co. to succeed D. O. Nash, who has resigned the post, was made recently by E. W. Jackson, Director of Parts and Service.

Nash leaves "Caterpillar" to associate himself with the Wortham Machinery Co., "Caterpillar" distributor with headquarters in Cheyenne, Wyoming. He will serve as vice president and general manager of the Wortham organization.

M. A. Clements

J. D. Uhll

Clements, who has served since October, 1946, as Western Division Service Manager, has been with the company since 1936.

The announcement of the resignation of Nash and the appointment of Clements to the position carried with it the word of the transfer of J. Dean Uhll, who has been Central Division Service Manager, to succeed Clements at San Leandro.

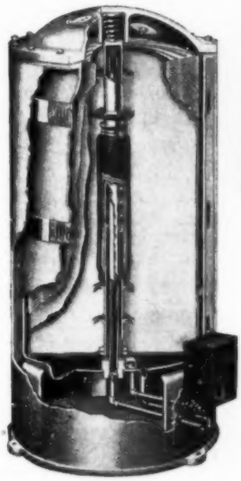
AMERICAN AIR FILTER, Inc., recently announced the appointment of Louis J. Cercone, Buffalo, N. Y., as sales representative in the Buffalo territory for the Engine and Compressor Division of the company. Mr. Cercone was formerly with Worthington Pump and Machinery Co. as Assistant to the Chief Engineer. In addition to representing the American Air Filter Company in the Buffalo territory Mr. Cercone is representing the Maxim Silencer Company.

Louis J. Cercone

ZALLEA BROTHERS & Johnson has now officially changed its name to Zallea Brothers. The address is still the same: Taylor and Locust Streets, Wilmington 99, Del.

J. E. PAYNE, industry sales manager for the Westinghouse Electric Corporation, Pittsburgh, Pa., announces the appointment of F. D. Weatherholt as assistant industrial sales manager with headquarters at East Pittsburgh.

NOTE: Performance data on four Fairbanks-Morse Diesel-Generators at Glencoe, Minnesota Municipal Power Plant, served by three Honan-Crane Lube Oil Purifiers and one Honan-Crane Fuel Oil Purifier, is contained in a special editorial article, "Glencoe, Minnesota—Municipal Diesels Thrive On Filtered Crude Oil," on page 44 in this magazine. It is an excellent demonstration of our contention that—



Actual Records Prove

More Engine Hours Per Maintenance Dollar

More Engine Efficiency Per Operating Dollar

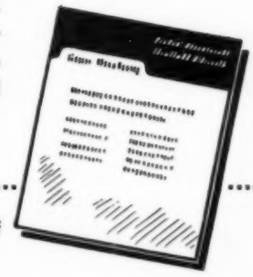
with

HONAN-CRANE OIL PURIFIERS

• The advantages of **Honan-Crane** Oil Purifiers in diesel engine operation are simply those of continuous operation on *clean* oil.

By actual records, compiled by users, **Honan-Crane** Purifiers, without exception have increased engine hours per maintenance dollar and improved engine efficiency per operating dollar—by any standards—in any comparison.

Actual proof of the efficiency of **Honan-Crane** Oil Purifiers is contained in the data gathered by Polymer Corporation, Ltd., Sarnia, Ontario, Canada, operators of thirty-eight 400 and 800 horsepower engines. We will send you the Polymer Story. Just fill out and mail the coupon.



Please send me the "Polymer Story of Oil Purification Benefits."

NAME_____

ADDRESS_____

COMPANY_____

CITY AND STATE_____

HONAN-CRANE CORPORATION

202 Indianapolis Ave., Lebanon, Indiana

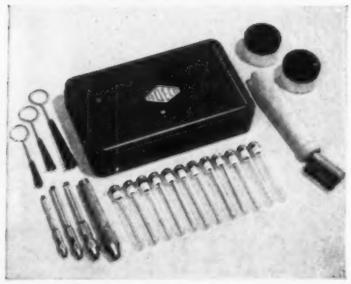
Subsidiary of HOUDAILLE-HERSHEY CORPORATION

KEEP YOUR DIESEL ENGINES OPERATING EFFICIENTLY

with these

ADECO

SERVICE AIDS



NEW ADECO NOZZLE SERVICE KIT FOR CLEANING INJECTORS

This handy kit includes all tools needed to clean out clogged nozzles and avoid possible damage to costly injectors. Complete with lapping compounds, in handy metal carrying case, *only $7.50 f. o. b. Chicago.*

ADECO NOZZLE TESTER

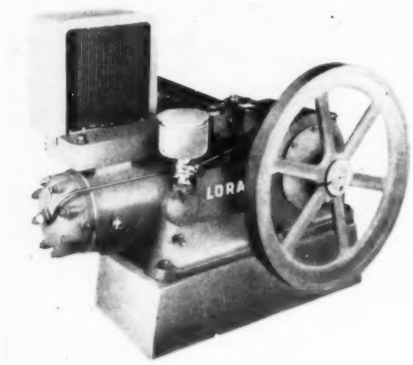
Compact, portable, sturdy, precision-built. Enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Pressures up to 10,000 p.s.i. Tests large or small injectors. *Complete with standard gauge, $58, f.o.b. Chicago; slightly higher, equipped with Navy-approved gauge.*

ADECO

AIRCRAFT & DIESEL EQUIPMENT CORP.
4401 N. Ravenswood Avenue
Chicago 40, Illinois

Manufacturers of dependable Fuel Injection Pumps, Nozzles and Nozzle Holders for the Diesel Industry.

New Multifuel Engine



Lorain type "O" Multifuel engine.

WHITE-ROTH Machine Corporation recently announced production of a new Lorain Type "O" single cylinder, horizontal, two cycle multi-fuel engine. The new engine, manufactured as a companion power plant to the current Lorain Type "L," is rated at 34.3 hp. at 450 rpm. It has a 9½ in. bore and 10 in. stroke with Timken bearings on crankshaft and cross-shaft. Wet-sleeve type cylinder liners are of alloy cast iron, assuring long life and easy replacement on location. This eliminates costly re-boring and shut down time. The engine may be operated as a cold starting, full Diesel or converted to burn natural gas or butane as fuel. Field conversion is easily accomplished.

For complete specifications send for Bulletin LO, White-Roth Machine Corp., Lorain, Ohio.

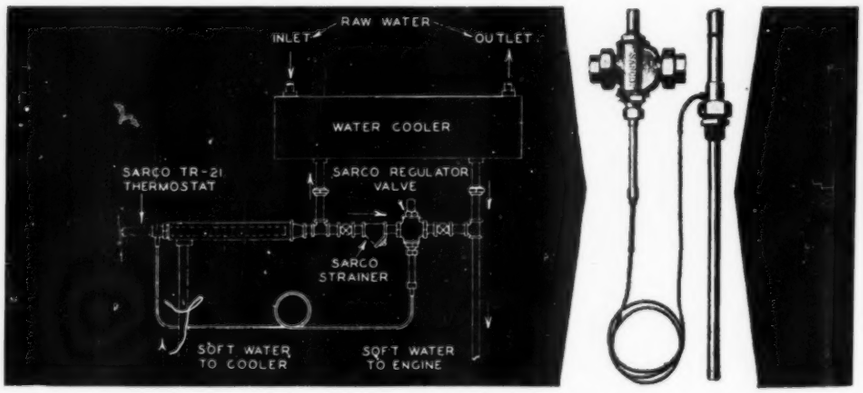
Woodward Annual Report Stresses Diesel Application

IN the annual report Woodward Governor Company announced several new developments in the Diesel governor field. During the past year a new governor for locomotives was developed and satisfactorily tested. Another governor of the pump mounted type was put in production along with a timing advance device.

The annual sales summary reveals that during 1947 approximately 12,000 Diesel governors were shipped from the factory to control an estimated 4,725,000 hp. The report also states that Diesel locomotives totaling approximately 3,100,000 hp. are equipped with Woodward governors.

Baldwin Elects Officers

THE Board of Directors of The Baldwin Locomotive Works recently elected the following officers: R. F. Doolittle, Vice President, Legal; Frank B. Powers, Assistant Vice President, Engineering; R. B. Crean, Assistant Vice President, Production; R. N. Watt, Assistant Vice President, Domestic Sales; C. A. Campbell, Assistant Vice President, Foreign Sales.



By-pass Temperature Control

FOR DIESEL COOLING WATER

The Sarco TR-21 Temperature Control is of the positive-acting, liquid-expansion type and has long been recognized as extremely accurate and reliable for all kinds of hot water and process temperature operations.

It is used extensively on Diesel engines because the by-pass method reduces the size of cooling equipment required.

The TR-21 is made in direct, reverse and three-way types, suitable for all Diesel operations. It is calibrated at the factory for any desired temperature, with adjustment provided by means of a key.

Where by-pass control is not desired, the Sarco Blender is eminently satisfactory. Ask for Bulletin No. 700 on Sarco Cooling Controls.

SARCO SAVES STEAM

SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO

Machine Tool Handbook

GENERAL analysis of the machine tool industry shows there is a serious lack of authoritative books on metal working tools. Fortunately, a number of machine tool builders have realized this serious shortcoming and are recognizing the importance of printing the complete story of their respective machines.

The latest work to be added to the small but growing list of urgently needed books on machining is the new Handbook for Horizontal Boring, Drilling and Milling Machines published by the Giddings & Lewis Machine Tool Co. In the 266 pages comprising this work, more than 325 illustrations, drawings, charts, diagrams and tables aid the reader in visualizing the practical information presented.

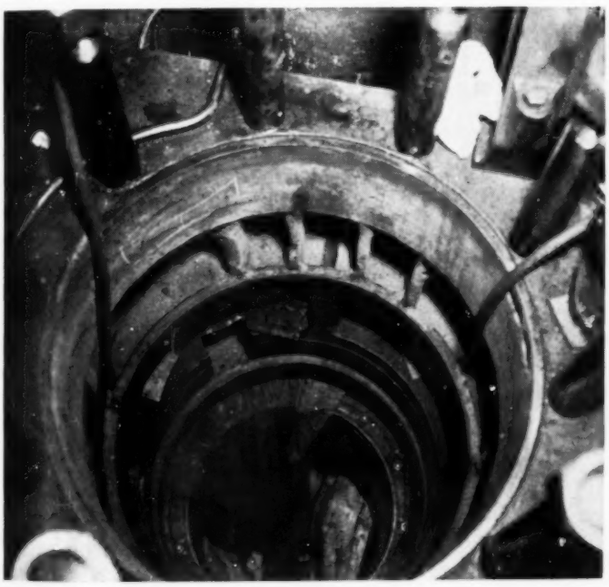
Any company or personal library on progressive machining practices will be incomplete without this Handbook and its subsequent sequel information which will be furnished from time to time. Copies are currently available through the Giddings & Lewis Machine Tool Co., Informational Service Dept., Fond du Lac, Wisconsin, at a cost of $5.00.

New Plant For Chicago Pneumatic Tool Company

THE Chicago Pneumatic Tool Company, prominent manufacturer of Diesel engines, will construct a huge new plant in Utica, New York, this spring.

Architect's rendering of new Chicago Pneumatic Plant.

The plant will be one of the most modern industrial buildings, in the East. With over a half-million feet in floor space, all on one story, it has been designed in accordance with the newest techniques in materials handling, work simplification, and safety provisions. Expanding markets and increased demand for the company's products are the reasons given for construction of the new plant. Utica was chosen as the site after a full year's investigation of industrial localities.



Pictured left is the #3 cracked cylinder of a Busch Sulzer 3000 HP 9 Cylinder Diesel Engine repaired by Metalock in 1943 at the Municipal Power Plant for the Village of Freeport, N. Y. It was necessary to remove a section which had been welded, shown in illustration. A new piece was then fitted and **Metalocked** and **Metalaced** in place, as shown in right hand illustration. To date for more than 4 years the repair has proven entirely satisfactory.

Inasmuch as no heat is used in Metalock repairs there is no consequent distortion nor inherent stresses. Metalock eliminates costly machining and downtime.

YOU TOO CAN USE

METALOCK

TO YOUR ADVANTAGE

WRITE TO METALOCK FOR FREE CATALOG

LICENSED AGENTS IN PRINCIPAL CITIES

Metalock Repair Service, Inc. **Dept. K, 36-15 48th Avenue**

Telephone STillwell 6-0330 **Cable Address: "METLOKCAST NEW YORK"** **Long Island City 1, New York**

LUBRICATION OF REFRIGERATING machinery is the subject of an informative article in the February issue of *Lubrication* published by the Texas Company. Copies of the magazine are available on request to the Texas Company, 135 East 42nd Street, New York 17, N. Y.

REVISTA INDUSTRIAL of Mexico is planning final details on the organization of a 33-car National Economic Recuperation Railroad Caravan that will tour the country during the next two years, it was learned recently. The train left Mexico City on February 29 and will visit every state of the country bringing to the people a practical demonstration of the latest industrial progress that the country has registered during the last few years. Many U. S. concerns with factories in Mexico will be represented.

Of the 33 freight-cars, it will include its own radio station, a car with a 200 kw. power plant, 22 exhibition cars with special aluminum show-cases, and 11 flat-cars for agricultural and carnival equipment.

A D-C AMPLIFIER control device of high industrial value because of its reliable operation under severe mechanical conditions which was developed in Germany is described in detail in a report now on sale by the Office of Technical Services, Department of Commerce. The apparatus has an overall sensitivity of some 10-17 watts and can deliver a substantially larger amount of power to various control devices than a suspended coil galvanometer. The report was prepared by OTS investigator R. A. Goodman.

A NUCLEUS of eastern and middle western weldries recently organized the American Weldment Manufacturers Association to promote mutual understanding among welders and users of welded products and to solve the problems that face the welding industry today. Prompted by the need for recognized standards and trade policies for the industry, a group of executives from several large commercial weldries established the association to aid the industry in profitable expansion and progress on its merits as a new competitive major manufacturing process. Ken F. Ode, Superintendent of the Welding Division of The Falk Corporation, Milwaukee, is the AWMA president.

A LARGER DIAMETER stick of pipe joint compound called Jumbo Pipetite-Stik for larger threaded pipe is announced by Lake Chemical Co.

Pipetite Jumbo Stik, like the regular size, comes in stick form. It is used by simply rubbing several strikes of the stick across the pipe threads. It spreads and fills threads when turned. For further information write Lake Chemical Co., 607 N. Western Ave., Chicago 12, Ill.

A NEW ACHIEVEMENT in bandsawing operations centers around the development of a spiral saw band recently released by the DoALL Company. This new saw, as the name implies, has a hard cutting edge which spirals around the band. This tooth innovation gives a 360° cutting edge so that material can be cut in any direction without rotating the work.

WIDESPREAD DEMAND and an increase in applications have caused Zallea Brothers to accelerate production of Duo Equalizing Expansion Joints. These joints have found favor for many types of service because they function in two ways: they equalize the compression among the corrugations simultaneously when the pipeline is expanding and likewise distributing the elongation simultaneously and proportionately among all the corrugations when the line is contracting.

Write for information on the new Zallea Duo Equalizing Expansion Joints to Zallea Brothers, Taylor and Locust Sts., Wilmington 99, Delaware.

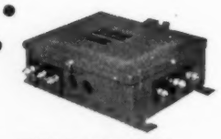
THE BALDWIN LOCOMOTIVE Works will deliver to the Chicago & Northwestern Railway in the immediate future a 1500 hp. Diesel-electric

Whatever your requirement

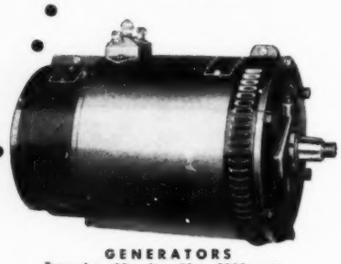
in DIESEL ELECTRICAL EQUIPMENT

you can depend on LEECE-NEVILLE for the best answer . . .

Pioneer manufacturer of Diesel electrical equipment, famous today for the unsurpassed quality of its products, Leece-Neville offers you the greatest selection of Diesel cranking motors, generators, voltage regulators and switches available anywhere. But if your specifications—in capacity, size, type of mounting, or any other point—cannot be met from standard models, you can depend on Leece-Neville know-how, gained in 38 years of designing and building special electrical equipment, to serve you well. For specific information, write *The Leece-Neville Company, Cleveland 14, Ohio.*



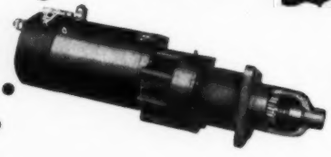
VOLTAGE REGULATORS
From 6 to 32 volts



GENERATORS
From 6 to 32 volts; 50 to 2000 watts.

HAND SWITCHES

MAGNETIC SWITCHES



CRANKING MOTORS
From ¾ to 30 hp. — 6 to 32 volts

HERE'S MORE POWER TO YOU!—For greater output at slow speeds, investigate the new Leece-Neville A-C Generating System. Weighs less, occupies less space, costs less than D-C systems of comparable output!

LEECE-NEVILLE
Pioneer and STILL Quality Leader

CRANKING MOTORS • GENERATORS • VOLTAGE REGULATORS • SWITCHES

locomotive with six traction motors on two six wheel trucks, the first of this type ever built. The locomotive is scheduled to be put into service as a transfer locomotive. It is the first of several of the same type that are now under construction at Baldwin's Eddystone, Pa., plant for special purpose jobs requiring higher tractive effort than can be obtained from the conventional four traction motors. These locomotives will have a single Baldwin 1500 hp., four cycle, supercharged Diesel engine, directly connected to a generator which will furnish power to the six traction motors on the axles.

THE GENERAL ELECTRIC Company's Chemical Department announced recently it has started to market seven standard grades of G-E silicone rubber molding compounds to molders and fabricators. All stocks withstand temperatures ranging from minus 70° to plus 520°F. and have excellent electrical and chemical properties.

General Electric said that the silicone rubber compounds, now used principally as gaskets in various types of industrial equipment, have many advantages including heat resistance, non-adherence to metal surfaces, good gasketing action because of low compression set and stability of surface hardness and resilience. Uses for G-E silicone rubber now include gaskets for high speed shafts, Diesel, gasoline, jet and gas turbine engines.

THE SELECTION of a suitable bearing alloy is based upon a knowledge of physical and metallurgical properties in relation to operating conditions. The Bunting Brass & Bronze Company has published the first of a series of technical papers presenting a resume of these factors, to assist the engineer and designer in selecting the proper alloy for a given type of service. Complete engineering data on physical properties is included. Write the Bunting Brass and Bronze Company, Toledo 9, Ohio, for this paper.

HERMAN H. STICHT Co., Inc., has just issued a new bulletin No. 576 which describes imported Swiss Stop Watches of Minerva make. The bulletin describes a great variety of watches, such as 1/5th Second Timers, 1/10th Second Timers, 1/100th Second Timers, Decimal Timers, Pocket Chronographs and Wrist Chronographs widely used by time study engineers and methodsmen. Write Herman A. Sticht Co., Inc., 27 Park Place, N. Y. 7, N. Y., for further information.

IN THE INTEREST of maintaining production and employment in 1948, General Motors recently launched an all-out effort among its employes, dealers and divisions to increase the flow of scrap iron and steel into the steel mills. GM is asking its 365,000 employes, its 15,000 dealers and managers of all its plants to cooperate in launching immediately a nationwide voluntary scrap metal drive. The purpose of the drive is to get every pound of scrap metal out of the homes, farms, factories and other business places and into the steel mill furnaces as rapidly as possible.

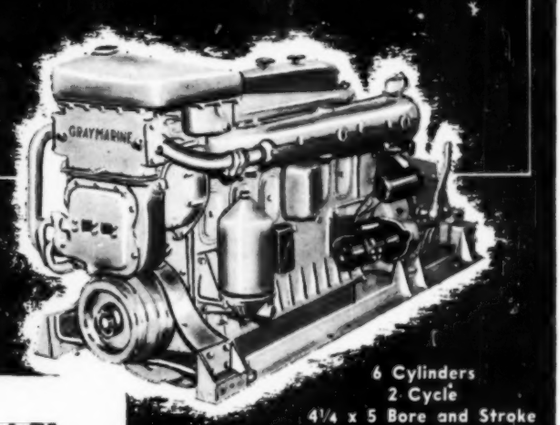
COOPER-BESSEMER Corporation has embarked on a six hundred thousand dollar improvement program, in an effort to increase its production of equipment sorely needed to help alleviate the shortage of natural gas. The program calls for the purchase of $325,000 worth of new machine tools for its Grove City (Pa.) plant and the expansion of its foundry facilities, and about $275,000 for equipment for the Mount Vernon plant.

CUMMINS DIESEL Engine Company has approved the Hydro-Borer Model A-4-F for precision boring of Cummins Diesel rods, according to word received by the Hydro-Borer Company of Inglewood, California. A notice has gone out from the Cummins Company to all service shops recommending the Hydro-Borer equipment.

REPS TOOL Company recently announced the publication of a new folder describing its line of pipe and stud extractors, which are made in ten sizes to handle pipe sizes from 1/8 in. through 2 in., and screw and stud sizes from 3/8 in. through 3 1/2 in. Write Reps Tool Company, Inc., 94 Allyn Street, Hartford 3, Conn., for this folder.

NO MATTER WHERE YOU GO

or how hard you look when it comes to selecting a small marine diesel you'll agree that, "There's no better buy today than a Benjamin's Rebuilt Gray."



6 Cylinders
2 Cycle
4 1/4 x 5 Bore and Stroke
165 H.P. at 1800 R.P.M.
225 H.P. at 2100 R.P.M.
Heat Exchanger Cooled
*Length 54-7/16"
*Width 29-1/16"
*Height 41-1/4"
*Dimensions Approximate

GRAYMARINE MODEL 6-71
MARINE DIESEL ENGINES

Each Engine thoroughly rebuilt and Guaranteed the same as factory New! for . . . . . 90 Days or 300 Operating Hours (whichever is prior)

Priced at approximately 1/3 cost of factory new!

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Gentlemen:
Please send me more information and price on your Gray with the Twin Disc type reduction gear checked—

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Add my name to your mailing list to receive your circulars on power equipment ☐ (check if desired).

My Name .....
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Benjamin's For Motors

MARINE and INDUSTRIAL POWER EQUIPMENT

CLARK BROTHERS announced in a recent bulletin that an entire plant has been revamped for production of Midget Angle Compressors. Now the company can promise delivery of these compressors in 3 to 4 months.

R. Y. FERNER Company recently announced the publication of a new catalog, describing in detail its complete line of small precision instrument screws, nuts and small tools. Included are precision machine screw counter-bores, helical gear rack and pinion stock, and precision metal saws. Write for catalog 100 from R. Y. Ferner Company, 110 Pleasant St., Boston 48, Mass.

ARMOUR RESEARCH Foundation Annual Report describes several research programs carried on during the past year which are of direct interest to the Diesel industry. A project attempting to discover the means of preventing the formation of engine deposits was inaugurated. The Nox-Rust Chemical Corporation sponsored a program of lubricating and additive evaluation, using the newly developed Lauson oil test engine. A lubricating oil endurance program was undertaken for the Standard Oil Company of Ohio which indicated that modern additive-type lubricants offered greater resistance to crankcase oxidation than moderately treated oils. Other tests are in progress to determine fundamental data concerning lubrication and fuel operating problems common to large bore, slow speed Diesel Power plant equipment. A large Fairbanks-Morse 2 cycle Diesel engine is being used in these tests.

AUTOMATIC SWITCH CO., formerly of New York City, has announced a move to Orange, New Jersey to 391 Lakeside Ave. The new plant offers many advantages in space, working conditions and room for expansion.

TRUETITE CORPORATION has recently announced a new type tube fitting adaptable to Diesel application. The new fitting is semi-steel flaring and is self-aligning. A 20° flare angle makes for uniform wall thickness at the point of flare as well as enabling the use of an inner and outer seal. For further information write the Truetite Corporation, 36 Union Avenue, Bridgeport 7, Conn.

LINK-BELT "DE" radial-thrust, self-contained preadjusted roller bearings are the subject of a new 16-page book. These bearings are of the angular contact (radial-thrust) type, with concave rollers operating between convex raceways. The new book contains tables of dimensions, weights, bearing capacities at given revolutions per minute, shaft fit tolerances, housing fit tolerances, and the necessary data for calculating the required bearing capacity for different types of machinery.

A copy of new Book No. 2196 may be obtained by addressing Link-Belt Company, Ball & Roller Bearing Division, 519 N. Holmes Ave., Indianapolis 6, Ind.

A NEW ROTARY PUMP now being introduced by the Ellipse Corporation, offers positive displacement, high volumetric efficiency and lower power requirements due to an entirely new principle in rotary pumps. The standard pump will handle lubricating oils, hydraulic oils, kerosene, fuel oils, coolants, etc., with capacities from ½ to 4 gallons per minute at 125 psi working pressure. It can be run in either direction without alteration. For higher pressures, other fluids or special operating conditions, contact the engineering department, 414 N. Kedzie Ave., Chicago 18, Illinois.

Foot-Mounted Ellipse pump

ADDING AGAIN to its rapidly growing fleet of Diesel-electric locomotives, the Erie Railroad has placed orders for four more 6000 horsepower, four-unit freight locomotives and thirteen switching locomotives. The seventeen Diesels are estimated to cost about $3,700,000 with delivery expected

SAVE COSTLY BREAK-DOWNS
(For repairs due to improper lubrication)
GET BETTER DIESEL PERFORMANCE With
D-X DIESEL MOTOR OIL

D-X is a *top-flite* Diesel Motor Oil that has proved itself *in use* to be a dependable lubricant under all types of operating conditions.

Its high film strength, high viscosity index and its high resistance to heat saves wear. Its high detergent action helps keep engines clean and free of deposits. It minimizes sludging because it resists oxidation. It is non-corrosive — safe for all types of alloy bearings. It is non-foaming.

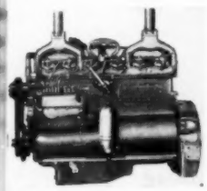
When you use D-X Diesel Motor Oil, you'll find your Diesels delivering more power at lower operating cost because they are cleaner. D-X Diesel Motor Oil is approved by manufacturers of Diesel engines for trucks, buses, tractors, marine and stationary installations. Write the D-X Office nearest you for prices and terms.

2 GREAT COMPANION PRODUCTS
DIAMOND DIESEL MOTOR OIL
— made in all grades. An efficient, economical lubricant for low-speed Diesels.
D-X DIESEL FUEL
— a complete line of top quality fuels for all types of Diesels operating under all conditions.

MID-CONTINENT PETROLEUM CORPORATION
Waterloo, Iowa Terre Haute, Ind. TULSA, OKLA. Chicago, Ill. Omaha, Nebr.

early in 1949. Participating in the orders for switchers were Baldwin Locomotive Company who will build four, American Locomotive four and Electro-Motive five. When received, the Erie will have an ownership of 110 Diesels, all but twelve of which were ordered in the last five years.

INTERNATIONAL HARVESTER Company's new Diesel engine, the six cylinder, 100 horsepower UD-16, is now in quantity production, H. T. Reishus, manager of the company's industrial power division, stated recently. This engine with 501-cubic-inch piston displacement and 4.4 x 5.5 inch bore and stroke is being produced at the company's industrial power division headquarters, the Melrose Park Works. Specifications include: inbuilt gasoline conversion starting system; hardened replaceable cylinder sleeves; precision main and connecting-rod bearings; induction-hardened bearing journals on a seven-bearing crankshaft; four-cycle, valve-in-head design; full-pressure lubrication; aluminum alloy pistons; large flywheel; single-orifice injection nozzles; and a fly-ball type governor which maintains selected engine speed within the engine speed rang. For further information write the Industrial Power Division, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

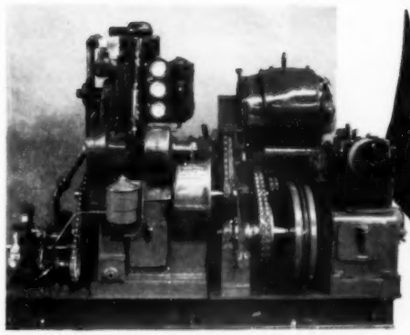


New 100 hp. International Diesel

RECENTLY ANNOUNCED is a new Laboratory Kit (rotameter type) designed to fill the need for a versatile and inexpensive flow measurement "set," to meet the varied flow measurement requirement of the research lab. It consists of a metering tube holder with base plate and hose connectors, four readily interchangeable tubes and six metering floats complete with calibration data. Capacities from 0.065 to 2200 cc./mm. of water and 5.0 to 36,800 cc./min. of air are covered. For complete information write to Dept. 5E-J, Fischer & Porter Co., Hatboro, Pa.

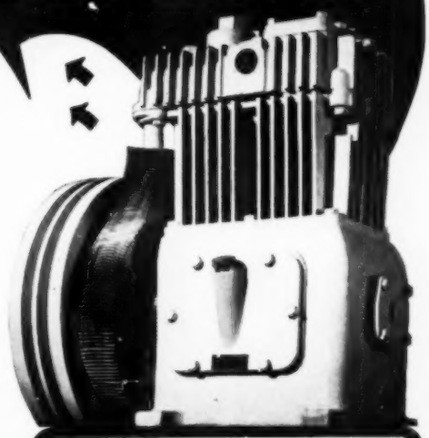
New Rotameter

TO PROVIDE instrument men with a complete yet compact guide to all Model C Micromax Indicating Controllers, Leeds & Northrup Company has just issued a new, 7-page catalog which presents these instruments for the first time under one cover. Write for Catalog ND44(3), "Micromax Model C Indicating Controllers," Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia 44, Pennsylvania.



SHEPPARD DIESEL Auxiliary Unit equipped with air cooled Quincy Compressor.

compact dependable AIR SUPPLY



COMPACTNESS and DEPENDABILITY are prime factors in the choice of air compressors for auxiliary service. Quincy offers a line of advanced design air compressors that are easily installed as an integral part of Diesel equipment. They can be relied upon for *dependable* air supply over a long, trouble-free service life. Sizes available from 1 to 80 cu. ft. displacement. Pressures up to 500 lbs. p.s.i. A Quincy compressed air specialist is ready to serve you. Ask him about your air problems.

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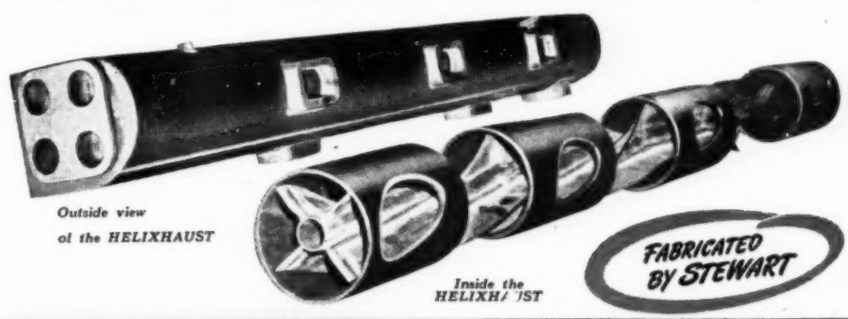
THE... HELIXHAUST WATER-COOLED MANIFOLD

The HELIXHAUST reduces temperature of exhaust gasses—makes engine room more livable. It increases permissible supercharged rating of Diesel engines. It's simple, yet highly efficient, neater and more attractive when mounted on the engine. *It modernizes 4-cycle Diesels by turbo-charging.* Write for literature containing complete specifications on the HELIXHAUST and details on Intake Manifolds, Water Inlet Headers and Water Discharge Pipes. Stewart engineers will be glad to talk over with you further the advantages of the HELIXHAUST Water-Cooled Manifold.



Outside view of the HELIXHAUST

Inside the HELIXHAUST

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Use it to *SPREAD* the national debt!

WITH MANAGEMENT BACKING, PAYROLL SAVINGS PLAN CAN HELP BUSINESS AND NATION

In 19,000 companies, the Payroll Savings Plan (for the regular purchase of U. S. Savings Bonds) has made employees more contented in their jobs—has cut down absenteeism—has even reduced accidents!

In addition, of course, the Plan builds financial security for each participant. Each Bond pays $4 at maturity for every $3 invested.

But the Plan has other, far-reaching benefits—to business and to the nation—which are equally important to you.

SPREADING THE NATIONAL DEBT HELPS SECURE YOUR FUTURE

The future of your business is closely dependent upon the future economy of your country. To a major extent, that future depends upon management of the public debt. Distribution of the debt as widely as possible among the people of the nation will result in the greatest good for all. How that works is clearly and briefly described in the brochure shown at the right. Request your copy—*today*—from your State Director of the Treasury Department's Savings Bonds Division.

WHY EXECUTIVE BACKING IS VITAL

Employees still want the benefits of the Payroll Savings Plan. In fact, they *need* the P. S. P., because banks don't sell Bonds on the "installment plan"—which is the way most workers prefer to buy them. But wartime emotional appeals are gone. Human nature being what it is, the success of the Plan in your company is liable to dwindle unless a responsible executive keeps it *advertised*. The *reasons* for promoting it are as important as ever—to you, your company, and your country.

So—today—*check up* on the status of the Payroll Savings Plan in your company. *Act* on your responsibility to see that it is vigorously maintained.

The State Director will gladly help.

"The National Debt and You,"

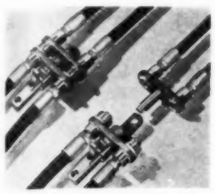
a 12-page pocket-size brochure, expresses the views of W. Randolph Burgess, Vice Chairman of the Board of the National City Bank of New York, and Clarence Francis, Chairman of the Board, General Foods Corporation. Request your copy from the Treasury Department's State Director, Savings Bonds Division.

The Treasury Department acknowledges with appreciation the publication of this message by

Editor—DIESEL PROGRESS

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council

A "BREAKAWAY" COUPLING which makes practical the hydraulic operation of farm implements, was announced recently by Aeroquip Corporation. Installed in the hydraulic lines between tractor and implement, the "Breakaway" coupling instantly and automatically disconnects without the use of mechanical attachments, whenever the implement becomes unhitched from the tractor.



New Breakaway Coupling

The Aeroquip "Breakaway" coupling is a twin unit connecting both pressure and return lines, using two self-sealing couplings mounted in a frame and held in coupled position by a mechanical latch that automatically trips when an external tug is applied to the connecting hydraulic lines. The coupling also disconnects by tripping a trigger even when the lines are under pressure. For further information write Aeroquip Corp., Jackson, Michigan.

ATTAINMENT OF BRITAIN'S 1947 coal target of 200,000,000 long tons is now within sight, for better tools and longer hours have resulted in rising coal production. Several times output has soared over the weekly target of 4,000,000 long tons.

LEFT: Diesel locomotives for main haulage ways come off assembly line. *RIGHT:* New mine locomotive is tried out on test track.

In the first half of 1947, 1,000 mechanical conveyors, 470 coal-cutters, 81 Diesel locomotives and four million feet of conveyor belting were sent to the pits, and further orders totalling more than $38,000,000 have been placed for delivery before the end of the year. Britain plans to spend in all $600,000,000 on boosting coal production.

HARLAND AND WOLFF have now completed at their London Works the reconversion of the passenger and cargo motorship *Highland Princess* which, during the war period served as a troop ship, and the liner will sail shortly for Brazil and the River Plate.

A NEW BOOKLET, *"Stainless Steel Piping*—Why and Where to use it," deals authoritatively with its subject and makes a welcome addition to the reference libraries of piping engineers. It was written by J. D. Mattimore, chief engineer of the product and research division of Tube Turns, Inc. The booklet may be obtained without charge by writing to: Tube Turns, Inc., 224 East Broadway, Louisville 1, Kentucky.

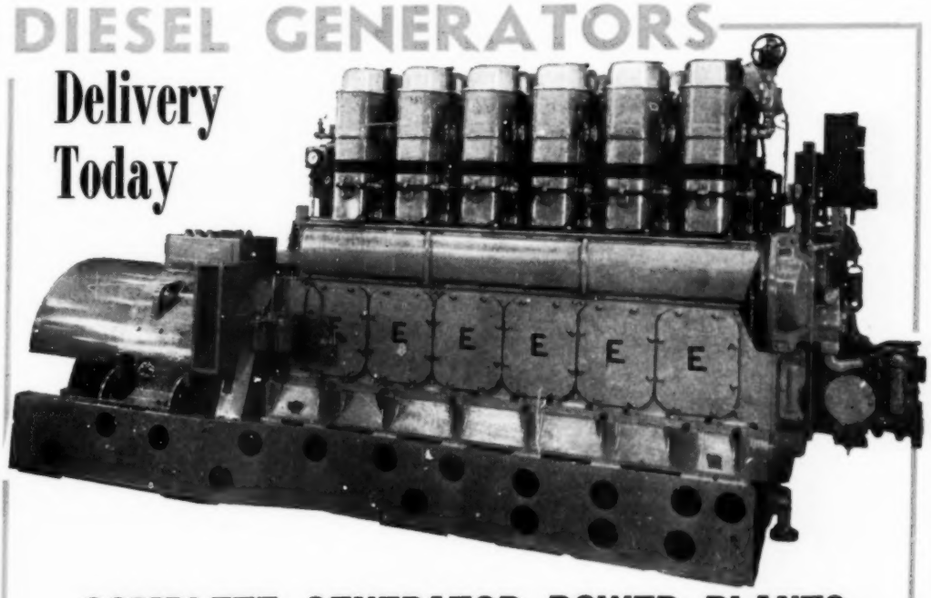
THE HYDRAULIC PRESS Mfg. Company recently announced a midget size hydraulic unit that can easily and quickly be put to efficient use on such applications as arbor presses, hydraulic clamping vises, forming, straightening, and bending devices, light material handling units, small balers, pressure inserting equipment.

Hydro-Power's "Ten-Ton-Tony" hydraulic power unit measures 6 in. x 7 in. x 9 in. overall. It has a capacity of 3 gallons of oil per minute at 1200 rpm. at 1000 pounds per square inch or 4½ gallons per minute at 1800 rpm. at 1000 pounds per square inch. It requires approximately 2½ horsepower to operate at 1200 rpm.

Order Your Copy of the 1947 DIESEL ENGINE CATALOG now. Thoroughly revised—more complete—indispensable. Convenient order coupon on page 87 this issue. Mail it today.

DIESEL GENERATORS

Delivery Today



COMPLETE GENERATOR POWER PLANTS

12—450 HP. Model DSG-6, 450 RPM, 12 x 15, 6 cylinder, Diesel engines direct connected to 12—250 KW Elliot direct current generators, 120/240 volt, 3 wire compound wound, 450 RPM. Complete with all necessary auxiliaries.

LARGE SUPPLY OF BRAND NEW SPARE PARTS AVAILABLE

HP	MODEL	KVA	RPM	NEW
8—1600	General Motors 16-278A	1200	720	95%
1— 450	Fairbanks-Morse 32E	375	300	95%
1— 225	Buckeye Model E	187	400	95%
1— 375	McIntosh Seymour	350	360	85%
1— 365	Ingersoll Rand S	340	600	95%
4— 360	Fairbanks-Morse YVA	300	257	80%
1— 300	Buckeye Model E	250	400	90%
1— 240	Fairbanks-Morse YVA	200	257	85%
7— 225	Buckeye Model 80	180	600	New
1— 180	Fairbanks-Morse YVA	150	257	95%
2— 150	Buckeye Model E	145	400	95%
4— 350	General Motors 8-268A	250	1200	95%
1— 90	Cummins HIS 600	62.5	1200	New
1— 80	Fairbanks-Morse YVA	65	300	85%
1— 75	Buckeye Model J	62.5	600	95%
3— 90	General Motors Model 6-71	75	1200	98%

MANY OTHER IMPORTANT DIESEL OFFERINGS FROM 15 KW to 1000 KW

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Whatever you are looking for in Diesel Engines, or
accessories, you will find them described and illustr
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edited by Rex W. Wadman. What's more, you will
complete specifications on

12th EDITION OF THE

822 DIFFERENT MODELS

The Products of 53 Engine Manufacturers. Each engine description is complet
accurate — checked and double-checked by the Manufacturer himself. Illustra
include full-page engine views, lube and fuel system diagrams, also cooling syste
many traced in color.

But that is just the Diesel engine section. The Catalog also includes an acc
section carrying valuable information on the various Fuel Injection Systems, Gea
Chain Drives, Turbo-chargers, Blowers, Magnetic Couplings, all fully described
profusely illustrated.

DIESEL ENGINE CA

53 DIESEL ENGINE MANUFACTURERS BUILDING 822 MODELS

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Hall-Scott Manufacturing Company
Harbin Handy Iron Works
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White Engine Works
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Worthington Pump & Machinery
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re is a Market Place Section—a directory of Diesel engines classified as to ratings d speeds with manufacturers' names and addresses — and a Product Directory ding accessories, parts, materials and services — all classified as to products. e Market Place tells you at a glance where to find what you want for your engine plant.

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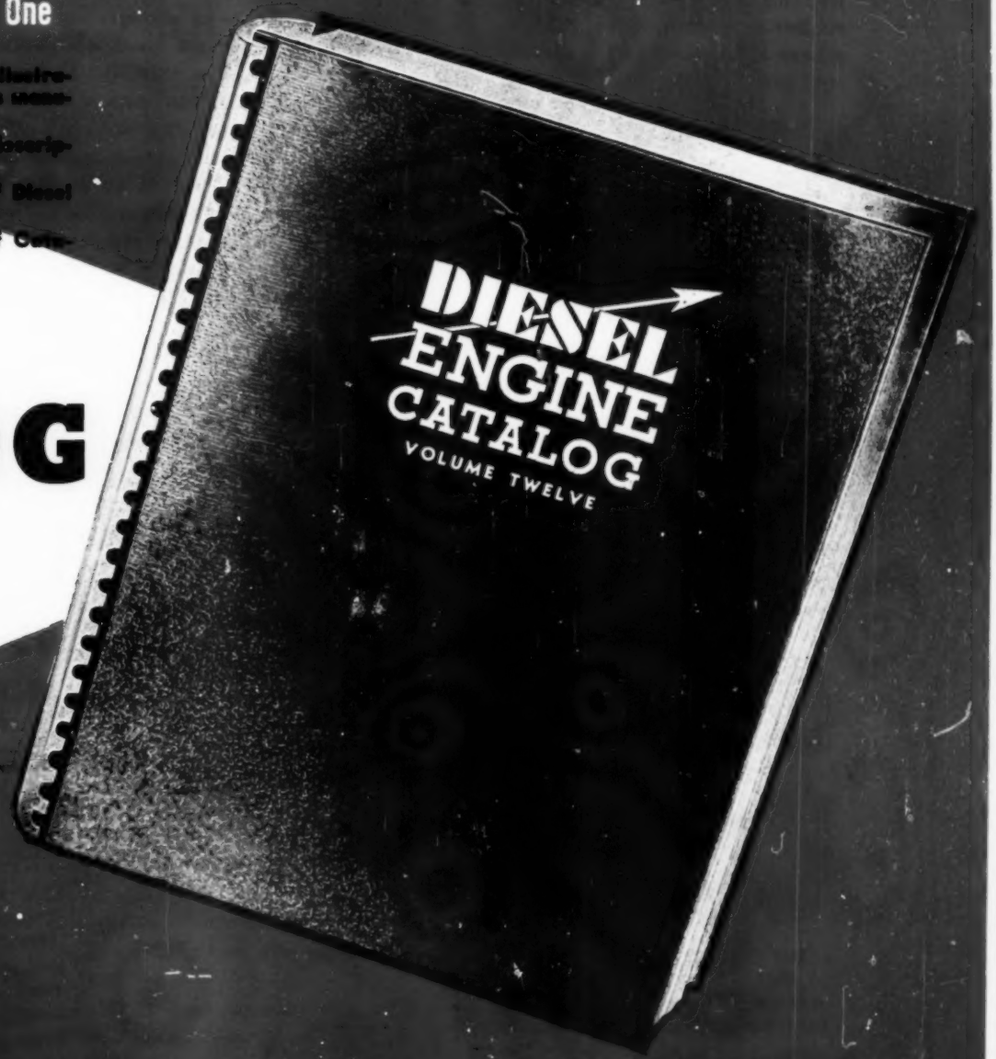
1. The main section is devoted to descriptions, illustrations and specifications of all the Diesel engines manufactured in this Country.
2. A large section carries complete illustrated descriptions of Diesel engine and plant accessories.
3. The Market Place — a classified directory of Diesel Engines and Accessories.
4. Manufacturers' Advertisements—131 pages of Catalog-type copy—informative—helpful.



NE CATALOG

REVISED ANNUALLY

The most widely-used Diesel reference book published:—Because the book is revised and brought up to the minute each year, thousands of design and operating engineers, purchasing and sales executives, Diesel students buy the DIESEL ENGINE CATALOG each year and constantly refer to it throughout the year. The 1947 Edition, Volume 12, embodies sweeping changes — new models and types, revised designs—and carries the basic information published in previous editions. Whatever your interest in Diesels is you will find this Edition of the DIESEL ENGINE CATALOG INDISPENSABLE.

DIESEL ENGINE CATALOG—
Two West Forty-Fifth Street—New York 19, N. Y.

Enter my order today for a copy of the New 1947 Diesel Engine Catalog, Volume Twelve, Edited by Rex W. Wadman, for which I enclose $10.00.

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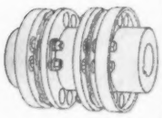
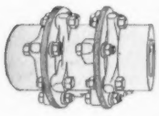
Flexible ALL METAL
COUPLINGS

Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.





The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.

BACKLASH
FRICTION
WEAR and
CROSS-PULL
are eliminated
NO LUBRICATION
REQUIRED!

PATENTED
FLEXIBLE
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THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

Write for New Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

Diesels On The Alaska Railway

Editor's Note: One of the most interesting letters we have received recently was from Traffic Manager L. A. Moore of the Alaska Railroad describing the use of Diesels in the far north. We publish it here as it is of general interest to the industry.

OUR streamlined locomotive 1050 consists of two 127 ton, 1000 hp. Alco Diesel units; engine model No. 39, turbocharged, type vertical, cylinders cast en bloc, mechanical type fuel injection, full Diesel. 6 cylinders, 4 cycle, bore 12½ in., stroke 13 in., piston displacement 9576 cu. in. Locomotive placed in service October 16, 1947.

A test run was made on passenger train from Anchorage to Fairbanks and return, a distance of 712 miles, handling 4 cars, 292 tons. Diesel fuel oil consumed was 735 gallons which at that time cost 14c per gallon; 1000 gallons of water used at a cost of 6c per thousand gallons; 4 gallons of lubricating oil used, which cost 83c per gallon. Total fuel cost $106.28. Cost per mile for fuel was .1492. Cost per mile, labor and material (maintenance) .3852. Cost per ton mile .0018. Delays en route for fuel round trip—none.

A similar run was made using one of our 900 class steam locomotives, which has approximately the same tonnage rating; handling the same number of cars and tons it was necessary to use 35 tons of coal at a cost of $8.67 per ton, 54,000 gallons of water at 6c per thousand gallons, 4 gallons of lubricating oil at 63c per gallon. Total cost for fuel $309.21. Cost per mile for fuel .4342. Cost per mile, labor and material (maintenance) .9066. Cost per ton mile .0045. Total delay for fuel on round trip—3 hours and 40 minutes.

Another test run was made on freight train from Whittier to Summit and return, a distance of 521.4 miles, using the same locomotives, each locomotive handling approximately the same number of cars and tons. The Diesel locomotive used 725 gallons of fuel oil at 12c per gallon, 4 gallons of lubricating oil at 83c per gallon. Total for for fuel $90.32. Cost per mile for fuel .1733. Cost per mile, labor and material (maintenance) .3852. Cost per ton mile .0007.

The steam locomotive used 37 tons of coal at $8.67 per ton, 50,000 gallons of water at 6c per thousand gallons, 4 agllons of lubricating oil at 63c per gallon. Total cost for fuel $326.31. Cost per mile for fuel .6258. Cost per mile for labor and material (maintenance) .9066. Cost per ton mile .0019. Total delays for fuel and servicing round trip—8 hours and 20 minutes.

You will note a difference in cost for fuel oil used on the passenger and freight trains. This was brought about by buying fuel oil on the freight train at Whittier where we get a lower rate than at Anchorage where we buy our fuel for our passenger trains.

We have found it necessary to equip the fuel oil tanks on our Diesel locomotives with an immersion type heater due to the fact the fuel oil we have been using in the past starts to congeal at 21° below zero, and we operate in weather from 60° to 70° below zero. However, we are now receiving from the oil companies a lighter Diesel fuel which will, no doubt, have a lower pour point. We have not had the opportunity to test this fuel up to this time.

We also have found it necessary to seal off 90 per cent of the ventilation to traction motors and the control room on account of operating through deep snow, which causes icing condition inside of locomotive. We have found main control contactors iced and made inoperative. When locomotive is brought into warm roundhouse it thaws out, causing grounds in the electrical equipment and we are, at this time, exerting every effort to correct this condition.

It may be surprising, but it is a fact, that our locomotive engineers inform us this Diesel locomotive will buck a nine-foot snowdrift better than a steam engine.

It is our belief that we have the farthest north Diesel operation on record. For many years the Alaska Railroad gave consideration to Diesel locomotives but always with misgivings. It remained for Col. J. P. Johnson, present General Manager, and a Diesel advocate of many years, to give the equipment a thorough test in Arctic temperatures.

Col. Johnson, a veteran Santa Fe mechanical official of 28 years, began planning for extensive Diesel power use immediately upon assuming charge of the Alaska Railroad following his separation from the military service. He operated Diesels in all war theaters and had the confidence to believe they would work in frigid zones. His faith in the equipment has been more than justified and his rehabilitation of the railroad, estimated to cost in excess of 50 millions, includes acquisition of sufficient Diesel locomotives to serve the entire line. The Alaska Railroad now has 9 yard engines and 7 line engines in service with plans to acquire 13 additional. All units acquired to date have been obtained through surplus property laws without funds and represent great savings to the American taxpayers who own the Alaska Railroad. Under the expert guidance of Col. Johnson and his Superintendent of Motive Power and Equipment, George A. Benedict, the locomotives were attuned and converted to climatic conditions in the far North and have given excellent performance in all seasons.

Burlington AUTOMATIC Synchronizer

This low cost unit provides positive protection against the hazards of incorrect paralleling of A.C. generators. It automatically controls circuit breaker closure when generator frequency, voltage and phase are correct.

Only one synchronizer needed for any number of generating units.

Write for further details.

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Owners advise that "there are several boats in our vicinity with more powerfully *rated* engines, but TIDINGS, with her **UNION** Diesel, was able to pass all of them. As equipped at present, we figure that the TIDINGS is the finest boat in the fishing fleet."

Conservatively rated **UNION** Diesel has enabled TIDINGS to catch more fish for greater profit.

UNION Diesels are available to meet your requirements. For economical, maximum power consistent with utmost dependability, contact **UNION** Diesel before you buy.

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World's oldest manufacturer of liquid fuel internal combustion engines
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COMPLETE WITH ACCESSORIES:
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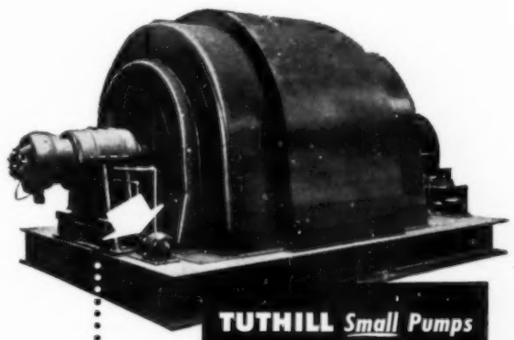


TUTHILL *Small* Pumps for BIG Lubrication Jobs

Just a handful of pump, but Tuthill Model L is outstanding in pressure lubrication and hydraulic service. This internal-gear rotary pump has the Tuthill mechanical seal for leakfree performance and low power consumption. Capacities up to 3 g.p.m. and pressures up to 400 p.s.i. Ring or foot mounting. Many porting arrangements. Write for bulletin on Tuthill Small Industrial Pumps.

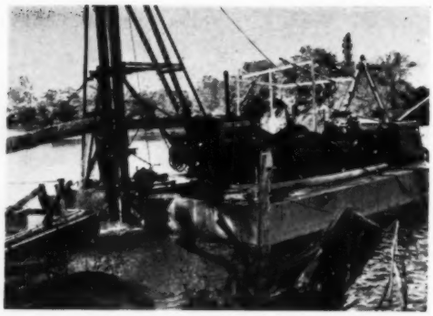
Tuthill Pumps

TUTHILL PUMP COMPANY
939 East 95th Street • Chicago 19, Illinois

Concrete Barge Pumper

A DIESEL engined pump, mounted on a concrete dredge, is being used to deepen the channel into a boat basin on a small Lake Erie island, offshore from Wilson, N. Y. The hydro-seal pumping unit, manufactured by Allen Sherman, Philadelphia, Pa., delivers 2,500 gallons of mud, sand and gravel per minute.

A Cummins Diesel engine drives the pump through a Twin Disc power take-off and V-belt. The engine turns at 1200 rpm. Diesel fuel consumed totaled only 250 gallons during the first six weeks of operation. Pumping is in progress eight hours a day, six days a week.



Cummins Diesel mounted in concrete barge

Mr. Beccue recently purchased this island, and intends to build a clubhouse at the basin during the coming summer. He also will use the basin as a yard for his marine equipment. At present, berths have been built to house 20 craft, and there is sufficient space for an additional 100. More dock space will be added as necessary.

KEEPING ABREAST OF POWER PROGRESS . . . . .

The new TOURNADOZER is protected against dust by a

DONALDSON AIR CLEANER

Dust and 'dozers go together, which makes dust protection for the prime mover essential. On the new Tournadozers, as on most heavy-duty equipment, Donaldson Air Cleaners are given the job of providing dust-free air for the engine, in this case a Buda 6DCS-844.

New power-driven equipment such as the Tournadozer presents new dust protection problems. Donaldson research, engineering and testing facilities are at the disposal of all manufacturers in solving these problems.

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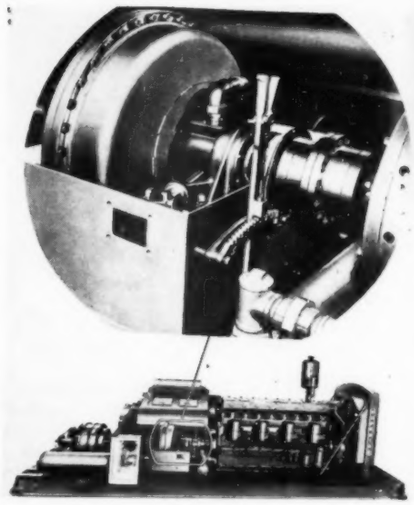
DONALDSON Oil-Washed AIR CLEANERS

SALES ENGINEERS: CHICAGO • DETROIT • CLEVELAND

Fluid-Drive Drilling Rig



Ideal-Gyrol Fluid Drive Mounted on National Supply Diesel rig.

A BUILT-IN Fluid-Drive is the outstanding feature of new Ideal Sectional Drive Groups for Ideal Type 100 and Type 125 Consolidated drilling rigs manufactured by The National Supply Company. The drive, in the 600 hp. size, adds only 37 in. to the length of the conventional engine assembly. The Ideal-Gyrol Fluid-Drive, as the new development is known, was designed to cushion the flow of power between the engine over a wide range of operating conditions.

A distinctive feature of the Ideal-Gyrol Fluid-Drive is its rapid regulation of the volume of oil in the rotors by means of a sliding scoop. This scoop may be used to maintain various degrees of filling and to alter the driving characteristics of the coupling. The coupling can also be quickly emptied of oil by means of the scoop, thus completely disengaging the engine from the power take-off shaft.

A temporary bulletin entitled "Sectional Drives for Ideal Consolidated Rigs," describes and illustrates the new Fluid-Drive units. It may be obtained on request to The National Supply Company, Box 899A, Toledo 1, Ohio.

Locomotive Diesels Featured in New Superior Catalog

THE Superior Engine Division of The National the Superior Engine Division of The National Supply Company has issued a special bulletin on the company's locomotive Diesels.

Copies may be obtained by writing The National Supply Company, Superior Engine Division, Springfield, Ohio.

John C. Tombaugh Dies

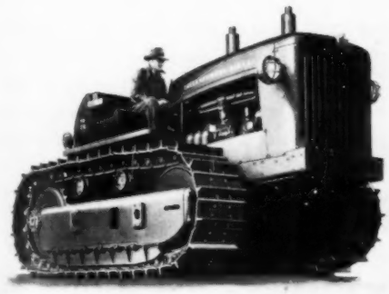
JOHN C. TOMBAUGH, Director of the Diesel Division of Utilities Engineering Institute of Chicago, died suddenly on January 14 at his home in Chicago.

John C. Tombaugh

Mr. Tombaugh was born in Washington, Pennsylvania, January 25, 1898. He had been associated with the Diesel field since 1933. In 1943 Mr. Tombaugh joined the Buda Company of Harvey, Illinois, and was engaged in writing Diesel technical training manuals and texts.

Mr. Tombaugh had been associated with Utilities Engineering Institute since 1945. Under his guidance as Director, the Diesel Division had recently enlarged both training program and physical facilities.

New International Harvester Diesel



This new International Harvester crawler is 182¼ inches long, 102 inches wide and 88 inches high from the ground to the top of the radiator, exclusive of the exhaust mufflers. With the six-roller track, as regularly equipped, it has 101⅜ inches of track on the ground providing 4460 square inches of ground contact and 1513 square inches of bracing grouser area with the regular 22-inch shoes. With water, fuel and lubricants and equipped as illustrated, the TD-24 weighs more than 38,000 pounds. With 180 horsepower at the flywheel, 167 belt horsepower and 140 drawbar horsepower, it is suited for heavy duty.

25,000 hrs. Without Overhaul

This Porter locomotive powered by two Model HBI-600 Cummins Diesel Engines recently completed 25,000 hours of extra-heavy service without an overhaul. Fuel consumption during the sixth year of operation averaged only 3.11 gallons per hour. The switcher is owned by the Missouri Portland Cement Company of St. Louis, Mo.

Esso Louisiana

Successor to the "Big Mamma," 315-foot stern-wheel inland river towboat, is the 2000-horsepower Esso Louisiana shown here just before leaving Dravo Corporation's Neville Island shipyard en-route to Baton Rouge, La. Although 110-feet shorter than the "Big Mamma," this new Diesel towboat is expected to outperform the larger vessel in every respect.

Morgan R. Kavanagh

THE Ohio Crankshaft Company announced recently with deep regret the death of Morgan R. Kavanagh.

Mr. Kavanagh came to Ohio Crankshaft in 1944 as factory manager of the company's aircraft subsidiary, Ohio Crankshaft Incorporated, and at the war's end became factory manager of the company's crankshaft and camshaft divisions.

Prior to his association with Ohio, Mr. Kavanagh held important executive posts with the Studebaker Corporation and the White Motor Company.

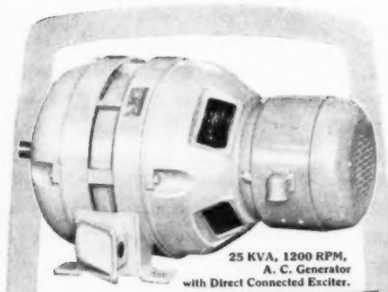
Built for Diesels!

SPLIT-SECOND STARTING

Globe-Union batteries are especially engineered to provide the high current rates and powerful sustained voltages required for Diesel engine starting.

GLOBE-UNION INC., Milwaukee 1, Wis.

SPINNING GLOBE-UNION POWER



25 KVA, 1200 RPM, A. C. Generator with Direct Connected Exciter.

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Columbia, with its years of experience, brings to you a wide line of performance proved, sturdily built, A.C. and D.C. Generators. **A.C. Generators: 6¼ to 375 KVA. D.C. Generators and Exciters: 2 to 200 KW.** Available in Single or Two Bearing Construction. *Write today for information. Our engineers will be glad to review your requirements. Prompt delivery.*

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3— 420,000 GAL. CAP. VERTICAL
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LUBRICATORS
A modern lubricator for modern service on Diesel, gas, steam engines and compressors. Supplies dependable cylinder lubrication in metered quantities reducing friction and wear. Capacities: 2 to 24 pt. and 1 to 16 feeds. New catalog on request.
RESULT OF 40 YEARS' LUBRICATOR BUILDING EXPERIENCE
McCORD CORPORATION
DETROIT 11, MICHIGAN
LUBRICATOR DIVISION

Change to Diesels Cited

BUREAU of Locomotive Inspection in its 36th annual report for the fiscal year ended June 30, 1947 reflects the change to Diesel motive power on the nation's railroads. For the first time in several years the number of steam locomotives reported upon dropped appreciably while the number of locomotives "other than steam," mainly Diesel, reported upon showed continued increases. Of the 94,034 steam locomotives inspected, 10,248 were found defective and 708 were ordered out of service. In the non-steam category a total of 13,115 units including electric, gasoline, and Diesel units, only 633 were found not up to standard and only 19 were ordered out of service. While steam locomotives were responsible for 16 fatalities, and electric locomotives for 2, Diesel locomotives were charged with no fatalities.

Society of Naval Architects

IN order to carry on the greatly expanded, varied and continuing activities of The Society of Naval Architects and Marine Engineers, the President, Vice Admiral E. L. Cochrane, U.S.N., (Ret.), has appointed new members to the various working committees for the year 1948.

New members have also been appointed to the Society's important Technical and Research Committee, which lends its support to the coordination of research in the fields of shipbuilding and shipping, and endeavors to foster research among the facilities available for such a purpose. The activities of this committee will be guided by a Steering Committee under the chairmanship of John E. Burkhardt, Technical Manager, Bethlehem Steel Company, Shipbuilding Division, Quincy, Mass., assisted by Admiral S. M. Robinson, U.S.N., (Ret.), Administrator of Webb Institute of Naval Architecture; Thomas H. Bossert, President, New York Shipbuilding Corp.; William Francis Gibbs of Gibbs & Cox, Inc.,; Rear Admiral Paul F. Lee, Bureau of Ships, Navy Department; Commodore Robert C. Lee, Vice President, Moore-McCormack Lines; and Rear Admiral Charles D. Wheelock, Deputy Chief, Bureau of Ships, Navy Department.

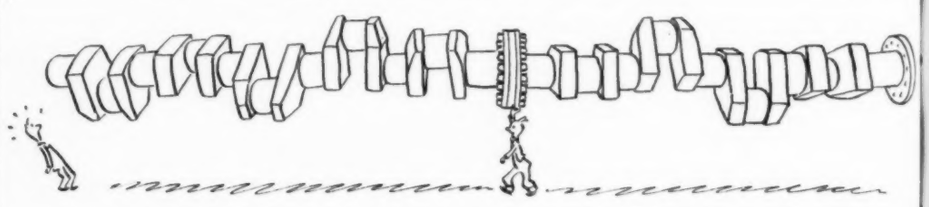
Daily Schedules for Diesel Streamliners

"EFFECTIVE February 29, 1948, the Super Chief and the El Capitan, crack streamlined trains of the Santa Fe Railway, running between Chicago and Los Angeles, went into daily service between those two points," Fred G. Gurley, president, said recently.

The Super Chief, the all Pullman luxury train and the El Capitan, all streamlined chair-car train, operating since May 12, 1936, and February 22, 1938, respectively, have a running time between Chicago and Los Angeles of 39 and ¾ hours. Both are Diesel powered.

General Electric Thermistors

G-E thermistors, electrical semi-conductors that respond to temperature variations as small as one thousandth of a degree Centigrade have been added to General Electric's line of metallurgical products. Available in the form of rods, disks, and bads, G-E thermistors are adaptable as the sensitive element in flow meters, time delay relays, switching devices and other types of indicators and controls. Since they are pure electrical resistances, they can be used with either a-c or d-c current.



New Radial Diesel Engines For Sale at 90% Discount

Marine Radial Diesel engines manufactured by the Guiberson Diesel Engine Co., Model T-1020, Series 5, 9 cylinders, 4 cycle, Bore and stroke 5⅛" x 5½", total piston displacement 1021 cu. in., net B.H.P. at drive shaft 210 at 2200 RPM. Fuel injection solid, air cooled with compression ratio 14.5 to 1. Overall dimension of engine 45 13/16". Gross weight 1005 pounds. Accessory equipment furnished with each engine as follows: Starter, fuel pump, clarifier, starter brush assembly, etc. Unit complete with one set of spare parts for each engine, and engines packed for overseas shipment completely sealed.

Original cost $7,000.00. — Our price $700.00 each F. O. B. Charlotte, North Carolina.

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Surge Snubber in the body of the unit reduces noise level below that of the associated machine. There are no screws, cover plates, or other parts to lose. Write for bulletin.

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DIESEL GM PARTS

Complete Assembly or Individual Parts

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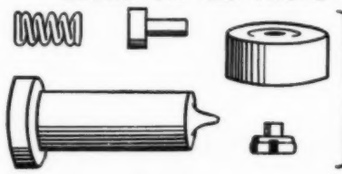

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1 Stop Check
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Sold in part or as complete assembly

These and many more

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5157393	Blower Assembly—Left
5157396	Blower Assembly—Right

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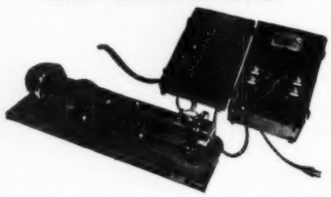

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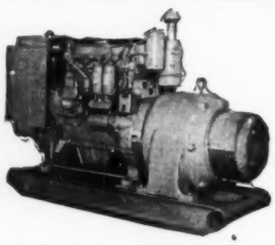

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Also compressor and pump units and combinations designed and built to order.
Also Marine Engines
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West Coast Diesel News

By FRED M. BURT

NEW 32 FT. crab boat *Six Brothers,* completed at the Genoa Boat Building Co., San Francisco, has been powered with a 55 hp., General Motors Series "71" Diesel, driving the propeller through a 3:1 reduction gear.

HARVARD PAUL STEWART has been appointed Manager of Marine Sales for Bethlehem's Bay Area Yards, as announced by W. M. Laughton, District General Manager, Bethlehem's Shipbuilding Division. Mr. Stewart is a member of the Society of Naval Architects and Marine Engineers and of Executive Committee Northern California Section.

W. A. HARRINGTON has been named Manager of the San Pedro, California, yard of Bethlehem Steel Company, located on Terminal Island, and Russell R. Sweeney is the new manager of the company's Alameda Repair Yard.

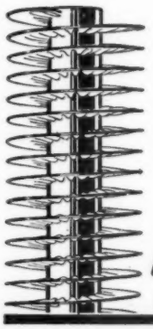
WHILE A 75 WATT Radiomarine phone was being installed in M. O. Moxley's 55 ft. tuna clipper by Shepherd Diesel Marine, San Diego, an 8 hp. Hallet Diesel was installed to operate a refrigeration system with a Baker compressor.

WORK ON TUNA CLIPPERS at Campbell Machine Co., San Diego, includes reconversion of 118 ft. *Invader* from ice to brine system involving use of a new 190 hp. Union Diesel auxiliary to drive a 100 kw. generator; also a new 100 hp. Union Diesel auxiliary is being installed in the *Navigator.*

TACOMA BOATBUILDING Company's Hull 100, one of the largest seiner-type fishing vessels ever built, 106 ft. x 26.8 ft. x 13 ft. a steel boat recently launched, will be powered with a 600 hp. Washington Diesel; auxiliaries three General Motors Diesels. This company has also purchased the plant and facilities of Harbor Boat & Yacht Co., San Diego.

PROPULSION POWER for the new tug *Cuyamaca II,* with wooden hull, 102 ft. x 14 ft. x 12 ft., under construction by San Diego Marine Construction Co., will be a 12 cyl., 1,200 hp. General Motors Diesel, turning 750 rpm. with direct drive. Auxiliaries will be 175 hp., 6 cyl. Cummins Diesels.

AEROFIN



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A Good Gasket is worth the Price!
It costs just as much to install a poor gasket as it does to make a tight, long lasting seal with VELLUMOID, the standard for nearly thirty-five years.
THE VELLUMOID COMPANY, Worcester, Mass.

DIESEL FUEL INJECTION SERVICE

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SPECIFY PICKERING FOR YOUR ENGINES

PORTLAND CONN.

THE FORMER Hodgson-Greene-Haldeman Shipyard, Long Beach, has been purchased by three partners, David F. Maxwell, who is president of the new corporation, Long Beach Marine Repair Co.; George A. Robinson, vice-president; Frank L. Mansuy, secretary-treasurer. Ten tuna clippers have been built in the yard, and the new company will carry on the same work, plus any small craft up to 150 ft.

BUILT BY PETERSON Boat Works, Tacoma, is a new 106 ft. tuna clipper for Frank Brehna, Jr., of San Diego, powered with a 6 cyl., 465 hp., Superior Diesel engine.

ADDED TO THE power equipment of the Meeker (Colo.) Power & Light Co., are two 8 cyl., supercharged, 825 hp. Superior Diesels, direct connected to two 500 kw., 2400 volt Elliott generators.

WESTERN FISHERIES CO. operating at Cordova, for new power is installing a pair of 165 hp. Gray Diesels in its tender *Cora B.*

DESERT MATERIALS, INC., operating in Inyo County, Calif., is installing a new 75 kw. Caterpillar Diesel generating set for use in screening pumice; purchased from Shepherd Tractor & Equipment Co.

LAST OF THE LONG line of tuna clippers built at the Hodgson-Greene-Haldeman shipyard, in Long Beach, before being taken over by the new owners, was the 125 ft. *Renown,* commanded by Robt. R. Alcott, Jr., in fishing for California Marine Curing & Packing Co., has a 650 hp. Superior Diesel for main power; auxiliaries are three General Motors Series 71, 125 hp. Diesels.

PURCHASED FROM Thomas A. Short Co., San Francisco, a "Caterpillar" marine Diesel engine is being used by Neno DiMaggio, Monterey fisherman, to repower his 38 ft. combination boat. It has a Twin Disc 2:1 reduction gear, and Exide batteries are being used with the "Cats" electric starting unit.

A NEW INSTALLATION to irrigate the wheatlands of Avelino Fernandez, Navajoa, Sonora, Mexico, utilizes a Fairbanks-Morse 120 hp., 2 cyl., 12 in. x 15 in. Diesel pumping unit.

NEW POWER equipment consisting of one 300 hp. and one 225 hp. Fairbanks-Morse Diesel generating sets goes to the Frigirifica y Empacadero, S.A., a meat packing plant in Hermosilo, Sonora, Mexico.

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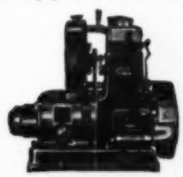

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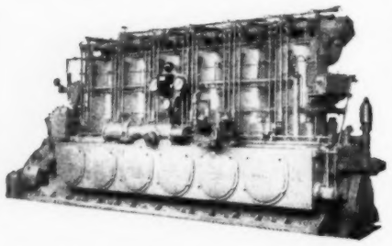

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